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Features of Central Steam Heat Plant Equipment

Underfeed Stokers Provide for Boiler Operation at 250% of Rated Capacity—Modern Coal and Ash Handling Apparatus Reduces Operating Labor — Water Softener Used to Treat Well Water

By W. A. SCOTT

The plant of the Spokane (Wash.) Central Heating Co., situated in the business district of Spokane, supplies steam heat to buildings within an area about 1 by 1.5 mi. in extent. On the main 36-in. low-pressure line that passes out from the central plant there is maintained the normal pressure of about 7 lbs. for general heating service. In addition to this there is a 5-in. high-pressure line in which a pressure of 110 lbs. is maintained for supplying steam to laundries, high-pressure elevator pumps and for similar service. About 0.75 mi. of this line extends to the union railway station, supplying steam for heating passenger coaches and station radiators. Approximately half the low-pressure load in the district served is for hot-water heaters in buildings.

All-steel mains for both low and high pressure

Firing Aisle in Boiler Room of Spokane (Wash.) Central Heating Co., Showing Wickes Boilers and Sanford Riley Stokers.

were installed by the American District Steam Co. and are equipped with a special system of expansion joints supplied by that company. They are insulated in the case of the low-pressure mains with 16-lb. asbestos paper, and in the case of the high-pressure mains with 85% magnesia, the pipe and insulation being incased in a 4-in. tin-lined wood log bound with heavy wire. The entire insulation as described was given an outside treatment with an asphalt preparation. The condensate from the high-pressure line is discharged into the low-pressure main, the hot water from the former passing to the latter re-evaporating to form new steam.

Water from the city wells used in the boilers is subjected to the Sorge-Cochrane hot-water process of water softening, the apparatus having the capacity for treating 300 g.p.m. and reducing it approximately to zero hardness. Prior to treatment the water contains 9.25 gr. of solids per gal. itemized as follows: Organic and volatile matter, 1.33 gr.; silica, 0.37 gr.; iron oxide and allumina, 0.16 gr.; calcium carbonate, 4.00 gr.; magnesium, 2.74 gr., and sodium chloride, 0.65 gr.

Boilers Fired by Means of Underfeed Stoker Equipment.

The plant fuel consists of bituminous slack and nut coal from the Bear Creek mines in Montana. A complete system of mechanical handling is applied to every phase from the dumping of the coal from the railroad cars into hoppers to its discharge into the boiler furnaces by underfeed stokers. To be more specific, the cars of coal are dumped into hoppers beneath the tracks which are at an elevation of about 10 ft. above the street grade. The hoppers discharge the coal to a pan conveyor that feeds into a Brown skip hoist, the latter elevating it to a hopper in the top part of the building. Then the coal is discharged from the latter hopper upon a belt conveyor by which it is distributed to the several bunker pockets. The coal is then drawn from the bunkers through hand-operated gates onto a traveling scale that passes along on each side of the firing aisle, discharging into the individual stoker feed hoppers.

The steam-generating equipment consists of 10 Wickes vertical 450-hp. boilers, which it is possible to operate at 250% rated capacity, or at 1125 hp. each. The fuel is fed to each boiler by a Sanford Riley 5-retort underfeed stoker unit. For each battery of two boilers there is a Sturtevant 15-hp. steam turbine that drives the two stoker units, the power being transmitted from the turbine shaft to the stoker mechanism through a system of reduction gears. The stoker feed may be varied by a speed changer in the gear box. Then, the motion of the grate bars is regulated independently of the coal-feed plungers. In this type of stoker, manufactured by the Sanford Riley Stoker Co., Worcester, Mass., the fuel is forced up from the point where air is admitted and is consumed on a series of inclined retorts. Distillation of volatile gases takes place in the retorts; the gases becoming mixed with air pass up through a bed of burning coke and thence through the incandescent fire zone.

Each boiler furnace is equipped with a Blonk efficiency meter and other devices. Other boiler accessories include a General Electric flow meter reading in boiler horsepower, Copes boiler feed regulators, Foxboro recording thermometers, and recording steam gages on both the low-pressure and high-pressure feed mains leading out from the plant.

The feed water is delivered by two Jeansville 3-stage pumps, each operated by a Westinghouse turbine. Forced draft for the 10 boilers is supplied by two Sturtevant units, each unit consisting of a steam turbine driving two turbovane fans through direct flexible couplings. The turbines are under control from the main header steam pressure. Each unit is capable of providing forced draft for the entire battery of boilers at normal rating.

The boiler plant is served by two stacks, each of 12-ft. inside diam. and 225 ft. high. The stacks were built of special chimney tile with a brick structure at the base. They are considered adequate for a possible installation of two additional boilers.

The plant contains an electric feed-water heater that is operated at times of off-peak load at the central electric station. It has the capacity to handle 110,000 lbs. per hr., the temperature rise being from 50 to 200 deg. F. There is a plunger pump for boiler-feed service which is used during light summer load. All boiler-feed pumps are equipped with Fisher governors for regulating the pressure on the feed lines, and all feed water is measured by V-notch meters.

For the disposition of ashes there are facilities for withdrawing them from the ash pans into small cars by which they are moved to and dumped into the same skip hoist that is used in hoisting the coal. By this hoist the ashes are dumped into a bin at the north end of the plant from which they are loaded by gravity into cars that pass beneath the bin chutes.

In the original equipment of this plant a number of years ago provision was made for a combination generating and central steam heating station. Consequently there is today intact but not in use three generating units of 1500-kw. capacity each, and two 1500-kw. rotary converters.

RADIO CENTRAL ON LONG ISLAND "TALKS" TO THE WORLD.

Radio central, the most powerful wireless station in the world, having such range and magnitude as to provide simultaneous communication with every continent, was formally opened on Long Island on Nov. 5.

The first message transmitted was one from President Harding to the people of all civilized nations. When completed, radio central will comprise 12 antenna units supported by 72 towers, spread out as the spokes of a giant wheel almost 3 mi. in circumference. Each tower is to be 410 ft. high, 12 of them already being up.

The sending plant is at Rocky Point, L. I., with the receiving station 16 mi. distant at River Head. At neither place are there any radio operators. All of the actual operating work in sending and receiving messages is performed 70 mi. away in the heart of the New York financial district. A fairly complete description of this plant was presented in a past issue of Electrical Review.

Coal Economy With Small Steam Power Plants

Keeping of Records an Important Factor — Tight Baffles and Settings Essential—Greatest Heat Loss to Be Found in Flue Gas —Paper Before North Central Geographic Division N. E. L. A.

By J. J. BRENNAN

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Steam power plant equipment is designed by engineers who are able to predict with fair accuracy the results to be expected with proper operation. Beyond that it is the problem of the operating engineer to know and to maintain the conditions necessary to produce power economically. This is especially true of steam boiler operation. Character of fuel, thickness of fire, air supply, and steam demand, all are interconnecting factors to be considered in maintaining the maximum efficiency in the boiler room—and each one of them must be worked out for the individual plant.

The operating engineer in the small steam plant is a busy man, with a multitude of duties and difficulties arising in everyday operation. He finds little time to investigate the causes of low efficiency. He is mostly concerned with keeping up with repairs and "pulling" the load. To him combustion means something more or less vague, involving difficult and tedious calculations that fail to help out when the arrow of the steam gage starts downward. Combustion is a theory, but its principles can be applied so directly and so effectively to the steam boiler that it is possible to eliminate a large percentage of the fuel waste so prevalent in steam power plants.

When coal is burned under the steam boiler the different paths taken by the heat thus generated are invisible. The eye can not detect how much heat is useful in making steam, how much is carried away by the gases going up the stack, how much is radiated from the boiler setting, and how much is lost through unburned coal dropping into the ash pit. Instruments for measuring certain conditions are necessary to determine the distribution of the heat—just as necessary to the engineer as the customers' watt-hour meters are to the bookkeepers in the office. Without meters the customers' bills would be a matter of guess work; without instruments in the boiler room burning of fuel is guess work.

In the average small steam plant 50% of the value of fuel is made to do useful work in generating steam. The other 50% is lost in three ways: 6% through unburned coal in the ashes; 6% through radiation and leakage; and 38% is carried away by the chimney gases. Reducing these heat losses means increasing the amount of useful work done by the fuel and correspondingly reducing the amount of fuel required. To accomplish this it is first necessary to determine the causes of the fuel waste and then to apply the remedy.

The loss of heat occasioned by the presence of unburned coal in the ashes is perhaps the easiest to detect and also the easiest to reduce to a minimum. The engineer can examine the ash removed from the plant and can readily detect the presence of an unusual amount of unburned coal which appears, generally, in the form of coke. Ash-pit loss cannot be reduced to zero, but it can be brought down to a minimum by the use of fuel best suited to the particular furnace and grate, and by more careful burning down and cleaning of fires by the fireman.

The heat lost through radiation is usually small and little can be done to reduce it without making expensive changes in the design and construction of the boiler setting. Radiation from exposed steam pipes and feed water lines is inexcusable. Leakage of hot water and steam should be almost negligible, but it is surprising to find the number of plants in which water and steam are allowed to escape in dark corners in basements and back of the boilers. It is only through constant and diligent inspection of all possible places where leakage might occur that this loss can be eliminated.

By far the greatest part of the heat not used in making steam is carried away in the chimney gases, and by far the greatest saving of coal can be made by controlling the amount of heat carried away in this manner. The causes of stack loss are five in number: (1) Hydrogen in the coal, (2) moisture in the coal, (3) incomplete combustion, (4) excess air, and (5) high flue-gas temperature.

High Flue-Gas Temperature a Source of Boiler Plant Loss.

Coal contains approximately 5% by weight of hydrogen. When the coal is burned this hydrogen combines with oxygen to form water which is immediately transformed into steam and superheated to the temperature of the furnace. As this superheated steam travels through the passes of the boiler its temperature is reduced to the temperature of the escaping gases, and the heat that was required to convert the water into steam and superheat it to the stack temperature is carried away. For each 1 lb. of hydrogen that is burned 9 lbs. of water result; and each 1 lb. of water absorbs 970 B.t.u. when it is changed into steam in the furnace, and 50 B.t.u. for every 100 deg. F. of temperature in the escaping gases above 212 deg. F. Water or moisture in the coal must be evaporated in the furnace and the resulting steam superheated. Each pound of water fired into the furnace with the coal absorbs 970 B.t.u. when it is evaporated, and 50 B.t.u. for each 100 deg. F.

of temperature in the flue gases above 212 deg. F. The loss occasioned by the presence of hydrogen and moisture in coal is beyond the control of the fireman, the engineer or the plant manager, except that they are able to reduce it slightly by preventing the gases from leaving the boiler at a high temperature.

Incomplete combustion seldom occurs in small plants except at intervals when heavy firing in hand fired furnaces supplies too great an amount of coal in proportion to the draft available. Excess air supplied to the furnace through the fuel bed and over the fire, leaking through large and small cracks in the settings, is the great cause of fuel waste in all plants. To burn 1 lb. of coal in the average furnace 15 lbs. of air is required, and 16 lbs. of gas results. Each pound of gas is raised from the temperature of the boiler room—say 70 deg. F.—to the furnace temperature by heat furnished by the coal. As this gas travels through the passes of the boiler some of the heat is absorbed by the water in the boiler in making steam, and the temperature of the gas is lowered to approximately 570 deg. F. when the gas leaves the boiler. Each 4 lbs. of escaping gas absorbs and carries away 1 B.t.u. for each 1 deg. F. that its temperature is increased above the temperature of the boiler room. In the case of supplying 15 lbs. of air per lb. of coal and discharging the gases at 570 deg. F., 2000 B.t.u. are carried up the stack. Had there been supplied 30 lbs. of air, or twice the necessary amount for each pound of coal, the resulting gas would have weighed 31 lbs., causing a heat loss of approximately 4000 B.t.u. or 33% of the value of coal containing 12,000 B.t.u. per lb.

Better Economy Would Result If Air Had to Be Purchased Like Coal.

Air is as necessary for combustion as coal, and if every power plant manager paid for it by check in dollars and cents, as water, oil and coal are paid for, less air would be used and less coal would be wasted. But air is free and it passes through the fire and the boiler setting unseen and unheard, exacting its toll in terms of heat that must be supplied by coal. Unfortunately, instruments suitable for directly measuring the amount of air used in combustion are few, expensive and difficult to apply and maintain in the small steam plant. It is possible, however, to determine quite accurately the amount of air supplied in excess of the correct amount by analyzing the flue gases as they leave the boiler. Other methods may also be used to accomplish the same result.

Air is a mixture containing 21% of oxygen which is necessary for combustion, and 79% of nitrogen which passes through the furnace and boiler unchanged and taking no part in combustion except to carry away a part of the heat generated by the burning of the coal. When all of the oxygen supplied to a fuel bed combines with the carbon, hydrogen and sulphur of the coal in perfect combustion no oxygen and no carbon monoxide will appear in the flue gas, indicating the absence of excess air. When excess air is present the flue-gas analysis will show a small percentage of oxygen. As the sum of the percentages of oxygen, carbon dioxide and carbon monoxide in the flue gas produced by burning coal cannot exceed 21%, and seldom does exceed 19% with bituminous coal, any increase in the percentage of carbon dioxide decreases the percentage of oxygen, indicating a decrease in the amount of excess air and a corresponding decrease in the amount of heat carried up the stack. The Orsat apparatus for the analysis of flue gas furnishes a simple means for measuring the amount of heat lost in the chimney gases on account of excess air and incomplete combustion.

Next to excess air high flue-gas temperature is the most common cause of fuel waste. It directly affects the loss of heat in the chimney gases occasioned by the burning of hydrogen, evaporation of moisture, incomplete combustion, and excess air. Every 4 lbs. of flue gas passing up the stack carries away 100 B.t.u. for every 100 deg. F. of flue-gas temperature above the temperature of the boiler room. High flue-gas temperature is caused by a too rapid flow of gas through the passes of the boiler, by leaking baffles, by soot and ash accumulation on the outside of the boiler tubes, and by scale and sludge deposits on the inside surfaces of the boiler.

Suitable Coal, Selected as Result of Actual Trial, Reduces Costs.

To save coal in the small steam plant without making expensive changes in equipment it is very essential to carefully select the coal most suitable for use with the particular equipment under the existing conditions of steam demand. This selection can be made only after a number of trials, keeping accurate records of the performance of each kind of coal. The value of these trials will not be confined entirely to the selection of coal. They will also furnish a standard that can be used very profitably for comparison with past and future operation. Many facts will come to light during the course of these trials, such as the presence of excess air due to improper draft and cracks in the boiler settings, leaky blow-off valves, high flue-gas temperature and poor damper regulation, all of which tend to reduce the efficiency of the boiler plant.

Having gone so far as to determine the most suitable coal it is folly to hope for any great reduction in coal consumption without first carefully approaching the human factor in the boiler room. The firemen are under the direct supervision of the chief engineer, and in matters of fuel saving as the engineer thinks so thinks the fireman. The engineer has been developed in his trade in the hard school of experience extending over a period of perhaps 20 yrs. He began his training at a time when coal was cheap—so cheap in some sections that it was not worth while trying to save it. It is only within the past 4 or 5 yrs. that coal economy in small plants has been given much consideration. It has not been the fault of power plant engineers that they have not been prepared to effect the desired savings in coal. They are of a peculiar type—somewhat jealous of their knowledge and skill acquired through years of hard experience—and may be reluctant to apply the principles of a theory more or less new and vague to them. Any effort in coal economy which carries with it the ridicule of "rule of thumb" methods will accomplish nothing. The confidence of the chief engineer must first be gained and he must be convinced that the control

of flue-gas temperature, regulation of drafts and analysis of flue gases point the way to lower fuel consumption. He must be educated to know the value and meaning of records of coal consumption, water evaporation and energy output, and how changes in operating methods affect these records. Further, he must be supplied with instruments that will enable him to apply the principles of combustion. He cannot know the temperature of the escaping gases or the percentage of carbon dioxide in the flue gases without a thermometer and an Orsat any more than he can know the steam pressure without a pressure gage, or the height of water without a water glass.

Coal economy cannot be attained over night. The change from fuel waste to fuel saving is not instantaneous. It comes to a plant gradually when full co-operation of manager, engineer and fireman is applied in observing the following nine maxims or boiler-room commandments:

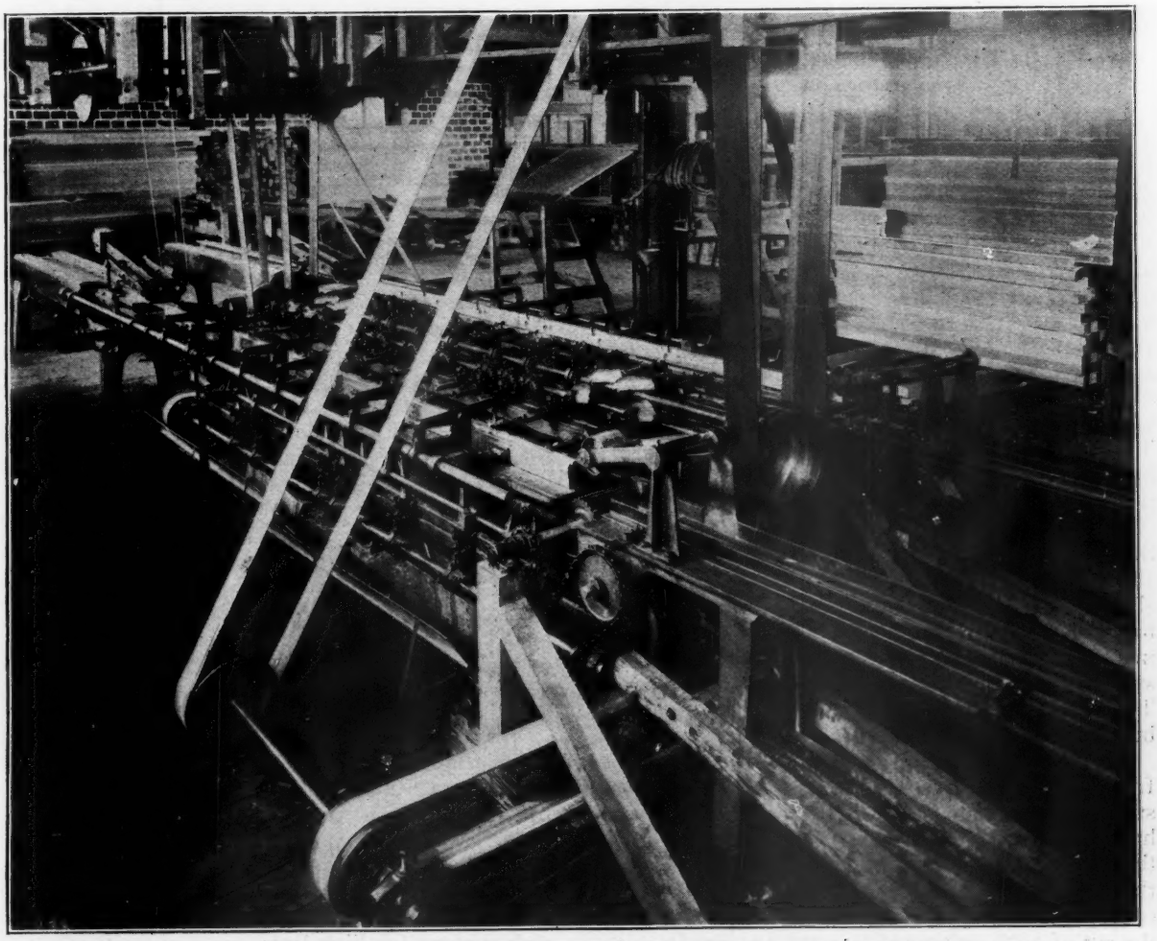
(1)—Keep boiler baffles tight.
(2)—Close all air leaks in boiler settings.
(3)—Keep boiler heating surfaces clean, both inside and out.
(4)—Stop all water and steam leaks.
(5)—Cover steam and hot water pipes.
(6)—Keep fires free from holes.
(7)—Use dampers to regulate draft according to load and flue-gas analysis.
(8)—Remember that coal, even though black and dirty, represents actual money.
(9)—Keep records.

SPECIAL MACHINERY AND EQUIPMENT IN CROSSARM PLANT.

High Rate of Production Attained by Employment of Suitable Equipment Arranged for Performance of Various Special Operations.

The manufacture of crossarms for pole lines required in transmitting electric power has become an industry of considerable magnitude in the various timbered regions of the United States. In this connection attention may be called to that industry in the Pacific Northwest where Douglas fir is used for this product. In that section the making of crossarms, with one exception, has been conducted as an adjunct to sawmill and other wood-working plants. The exception to this is found in the exclusive crossarms factory of the Barnes-Lindsley Manufacturing Co., Portland, Ore. This recently completed modern plant, which replaces one formerly used, is equipped with specially designed machines and devices for the several processes by which crossarms are turned out at high speed.

The plant structures consist of a 2-story factory building, 70 by 160 ft., a hollow-tile and concrete powerhouse, 45 by 85 ft., a 2-compartment dry kiln equipped by the Western Vapor Kiln Co., and an ample unloading and sorting shed. The Douglas fir stock for crossarms is received in two sizes, 3.5 by 4.5 ins., and 3.75 by 4.75 ins., and 6 ft. and over in length. After being passed into the kilns on trucks and dried,

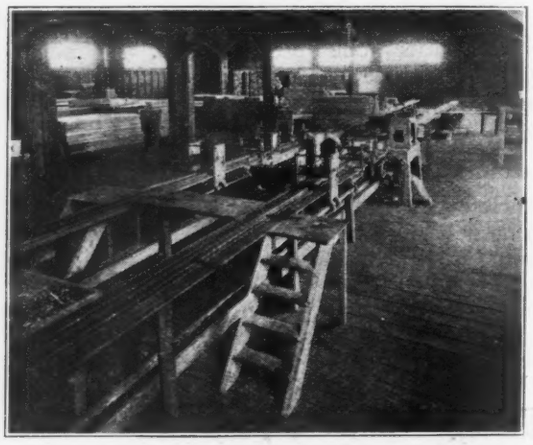


View of Boring Machine Constructed to Automatically Handle and Bore Crossarms.

the stock is transferred to a cooling platform and thence elevated to the second floor of the factory where the individual pieces are planed. They are next carried by chain conveyors to a cut-off saw, thence over live rolls to the trimmer. These are ordinary processes, of course, but the operations of the boring and shaping machines that follow are of special interest. These machines were designed by E. L. Barnes of this company and were made in a Portland shop.

Automatic Boring Machine Handles Cross-arms at High Speed.

The boring machine operates automatically and is double acting; that is, it bores both on the forward and backward strokes of the carriage. It is equipped to bore eight 3-ft. arms at each stroke and may be geared to make three, four or five



Shaping Machine in Plant of Barnes-Lindsley Manufacturing Co.

strokes per minute, resulting in a maximum output of around 10,000 arms 3 ft. in length per day. At the feed end the arms are carried by moving belts along two feed troughs to the machine by which the arms are clamped, bored and then released and delivered to a conveyor that leads to the shaper. The pin holes are bored by a side-wise motion, and the brace and pole holes by upward strokes. The bits of the machine are threaded and screwed into their seats. The shaper conveyor passes the arms under a trip-hammer stamping device by which each arm is branded. This is followed by shaping the ends of the arm by sets of swinging shaper heads thrown into action and disengaged by compressed air.

An accompanying illustration shows a view of the boring machine with belt drive from a line shaft above. Another illustration shows the shaping machine with the conveyor leading thereto. All machines and automatic handling equipment are operated by a 150-hp. Atlas engine, steam for which is supplied by two 80-hp. boilers. The boilers are equipped with dutch ovens for burning mill-refuse fuel.

Relative to the Douglas fir resources in the forests of Oregon and Washington, it may be stated that the latest statistics show that Oregon has 342,000,000,000 ft. of standing timber, and that in 1920 the mills cut 2,347,850,000 ft.; and that the state of Washington contains 132,051,000,000 ft. of similar timber standing, and that the cut of 1920 amounted to 4,275,124,000 ft.

"SERVICE" RESTORED IN RECORD TIME AFTER INTERRUPTION.

Equipment Collected Together and Connected Up Within 36 Hrs. in Spite of Adverse Weather Conditions That Prevailed.

A demonstration of the meaning of the word "Service" in the name of the Public Service Co. of Northern Illinois has just been completed. An accident to the Barrington (Ill.) substation, which occurred shortly after 7 a. m. on Saturday, Sept. 24, resulted in total interruption to the electric service in Barrington, Arlington Heights, Dundee, Palatine, Wauconda, Lake Zurich, Algonquin and Carpentersville. By 7 p. m. the following Sunday a temporary substation had been erected on the property and was supplying service as usual to the above communities. The entire equipment for this temporary substation had to be hauled by truck from Joliet and Evanston. Three 200-kw. oil-cooled transformers were loaded at Joliet and hauled by truck and trailer to Barrington. Boosters for supplying the 9000-volt circuits, oil switches, disconnects, fuses, etc., were obtained by truck from Evanston. No equipment in the original substation was in sufficiently serviceable condition after the accident to aid in restoring service.

The restoration of service the following day was made possible only by the spirit of loyalty and readiness to serve, not only of those immediately concerned with the work, but also of others who voluntarily did whatever was possible. A line gang from Evanston joined forces with the line gang from Crystal Lake, and together with the station construction men worked steadily—part of the time in the rain—until the work was finished.

The original substation contained a double bank of 200-kw. air-blast transformers supplying two 9000-volt, 3-phase circuits through oil-cooled boosters and automatic circuit regulators, two 2300-4000-volt regulated circuits, and the Barrington street lighting circuit. There was also the necessary switchboard equipment for this service and switching equipment for two incoming transmission lines. The temporary installation consists mainly of one bank of outdoor oil-cooled transformers tapped off the 20,000-volt line between Lake Bluff and Crystal Lake, one set of boosters supplying the two 9000-volt circuits, necessary fuses and arresters for the two 2300-4000-volt circuits, and one street light regulator. Except for the transformers this equipment is housed in a temporary structure erected for the purpose. The company and its employes who co-operated in this achievement are justly proud of their work and of their demonstration of their idea of "Service."

Work on the $130,000 improvements to the electric light plant of the Oklahoma Gas & Electric Co. at Enid, Okla., is progressing rapidly. Sixty-five men are employed and construction is expected to be completed by Dec. 1. When the enlarged plant is in operation Enid will no longer be dependent upon high-line service for part of its supply, but the plant there will be able to furnish current for high lines.

Protection of Transmission Lines With Condensers—Part II.

High-Frequency Disturbances and High-Voltage Surges Relieved as Result of Satisfactory Performance of Static Condensers — Influences of Short-Circuit Eliminated in Test on Heavy Line

By GEORGE LEWIS
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The Mosciki tube condenser has completely displaced the ordinary glass plate and jar type of condenser for use on transmission circuits having potentials greater than several thousand volts. The general construction of the Mosciki tube is somewhat similar to the Leyden jar, as it consists of a thin glass tube coated on the inner and outer surfaces with a thin deposit of silver acting as a base for the thicker coating of copper. The practice of applying a thin coating of silver is introduced for the purpose of excluding all air bubbles which are so disastrous to the efficient operation of a high-potential condenser. While this silver reduces the size of the air pockets, investigation shows that a much greater dielectric loss exists in Mosciki condensers than in the glass when the charging plates are in intimate contact with the glass, the necessary precautions having been taken to eliminate any intervening air spaces. This increase in loss is no doubt due to the ionization of the minute air pockets between the silver particles.

At the top edges of the dielectric where the potential gradient is increased by the unequal distribution of the flux lines the glass is made quite thick to prevent overheating and puncture. The condenser unit is assembled in a brass protecting tube, the space between the outer surface of the glass and the containing tube being filled with a low-freezing-point mixture of glycerine and water. The liquid filler in this condenser is employed to (a) conduct the heat generated by the dielectric losses to the outer walls of the brass container for radiation, thereby lowering the extent of local overheating, and (b) to provide an elastic cushion in the form of a shock absorber for the long, thin tube forming the unit. The condenser unit is supported in the brass protecting tube by means of a rubber sleeve or gasket at the top and a spring contact at the bottom, these two

Installation of Mosciki Condensers on 3-Phase Circuit in Substation.

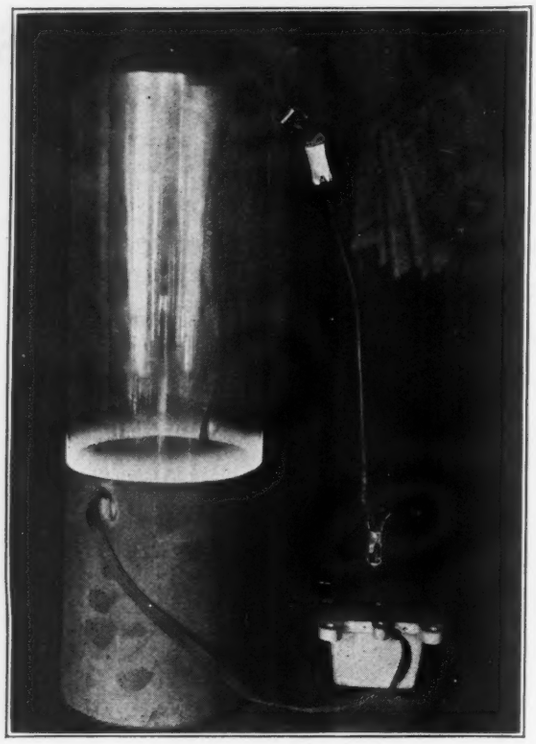


Illustration Showing Relative Size and Performance of Two Different Condensers Subjected to Equal Stresses.

supports tending to make the assembled unit less fragile.

Two commercial sizes of Mosciki condensers are manufactured, the smaller condenser known as "the half tube" measuring approximately 2.5 ins. diam. and 24 ins. in overall height, and having a capacity of 0.002 microfarads. The larger tube is of the same general construction as the smaller one, but with an increased length of 38 ins. and having a capacity of 0.005 microfarads. Condenser tubes of this class are tested at a potential of 25,000 volts (maximum value), the working potential, however, being in the neighborhood of 15,000 volts. The tubes are assembled in a rack so arranged as to be readily connected in series or multiple banks as demanded by the capacity required or the potential of the operating line. An idea of the general construction of the tube can be obtained from an accompanying illustration which shows one of the half-size units.

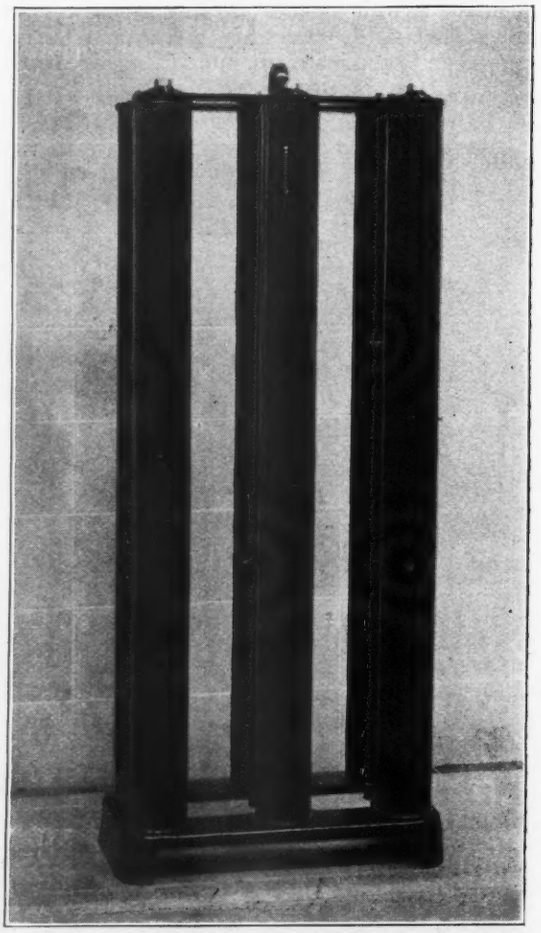
Meirowsky Paper Condenser for Use in Connection With Power Circuits.

The Meirowsky condenser is somewhat similar to the Mosciki condenser in terms of physical dimensions and electric characteristics, but is designed with a view of increasing its ability to withstand mechanical shocks by substituting a fibrous paper dielectric for the glass. The unit is constructed by tightly rolling the paper bakelite-impregnated dielectric and metallic coating plates on a mandrill some 2 ins. in diam. An accompanying illustration shows the general construction of the condenser tube. Its fittings for mounting are shown at each end in the form of a flanged metal insert which acts as a combined terminal and mounting device. This tube is constructed to have a capacity of 0.002 microfarads and to withstand a test potential of 20,000 volts (maximum). A tube of the type here shown has an overall length of 23 ins. with an outside diameter of 2.75 ins.

It has been found that a leaky condenser or a condenser having a relatively high dielectric loss angle is rather sluggish under charge; that is, the condenser charges at a low rate and, where high-frequency oscillations are encountered having a frequency somewhere in the vicinity of 500,000 cycles, the condenser is not particularly efficient in providing a shunt path to ground. This phenomenon has been noted in practically all electrostatic condensers employing paper or fibrous material as the dielectric when the operating potential imposed in a single dielectric is increased above a few hundred volts.

Dubilier Mica Condensers Prove to Be Compact and Efficient.

The mica condenser has within the last few years passed through a fairly rapid development field. Just prior to the great war mica condensers were replacing glass condensers on transmission lines and for radio telegraphic work. After the outbreak of the war the demand for more compact and efficient condensers was stimulated to such an extent that the factories manufacturing condensers of the mica type in America and England were greatly enlarged and were fitted for the study of more advanced research problems rela-



Meirowsky Paper Condenser Units Assembled in Form for Station Installation.

tive to condenser design and manufacture. Mica condensers have at present reached an unquestionably high point of development and are rapidly replacing other types of condensers for use in connection with high-potential circuits of both commercial and radio frequencies.

This form of condenser is constructed from a first quality India mica by interleaving alternate sheets of mica and tinfoil after the usual custom of building up a single-section multiple condenser. The completed unit is then tightly compressed and given the necessary wax-vacuum impregnating process.

The design of mica condensers is so drawn as to prevent brush discharges or corona from taking place around the edges of the charging plates. Many attempts have been made to suppress brush discharges in static condensers by applying a thick insulating coating over the edge of the plate or by immersing the units in oil. None of these methods, however, eliminate brush discharges. Investigation has shown that brush discharge can only be eliminated by impressing a potential on a single thickness of dielectric of less than 1000 volts. Single mica condenser sections are connected in series in order to reduce the electrical stress and accompanying brush discharge.

A mica condenser unit is shown in an accompanying illustration as being composed of 25 individual sections connected in series. This illustration shows the general method of assembly and the series connections which are made by extending the charging plates beyond the active mica dielectric so as to be connected to the adjacent section without the introduction of connecting wires. Each series section is insulated, as shown, by mica barriers to prevent surface leakage or danger of the sections being short-circuited during assembling. An illustration has been prepared showing two condensers of equal capacity connected in multiple at the same point in an electrical circuit so that they receive identical potentials. The magnitude of the brush discharge at 20,000 volts is clearly shown as extending upward from the edges of the charging plates of the Leyden jar, while no trace of brush discharge or corona takes place on the small mica condenser. This illustration also shows the reduction in physical dimensions brought about by the introduction of mica-type condensers. A complete unit consisting of the desired number of series sections is tightly held with a steel clamp and assembled in an all-metal container.

Series Resistance for Absorbing Energy Passed Through Condensers.

A resistance is usually connected in series with the condenser for the purpose of absorbing a certain amount of energy which passes through the condenser at the time high-frequency oscillations take place. The value of this resistance, as in the case of a horn gap, is a subject for discussion. At present it is the practice to make this resistance equal to or greater than the capacity reactance of the condenser at the frequency against which protection is desired, and less than the resistance required for a horn-type gap.

European transmission systems are being protected by a combination of resistance and capacity so proportioned as to pass a current of from 0.03 to 0.08 amperes when operated in connection with moderately low-pressure systems. The later types of static-condenser protective devices are being operated without series resistance. An accompanying dimensional diagram shows the connections of a static condenser and its accompanying apparatus as recommended by G. Capart. In this connection the condenser is connected between two self-inductance coils, the outer or line inductance being shunted by a resistance which acts as a high-frequency bypass circuit. The Capart type inductances or choke coils are constructed of iron wire, it being claimed that the inductance effect of a coil is very small when dealing with steep-wave front surges, but a self-inductance constructed of iron wire introduces an enormous diminution in the abruptness of the traveling wave. Another illustration shows a typical installation of Dubilier mica condensers for a 3-phase line as installed by G. Capart on a line of Campagne des Mines D'Anzin. The potential of this circuit is 50,000 volts. Since the

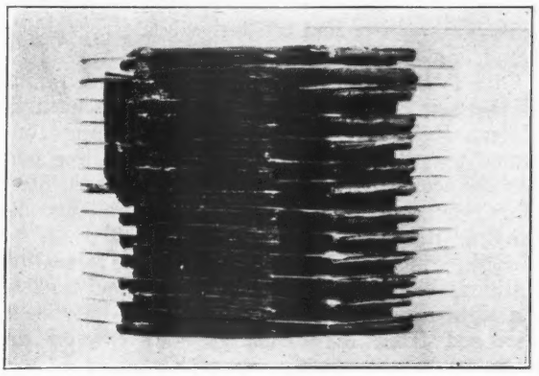


Illustration Showing Method of Assembling Dubilier Mica Condenser.

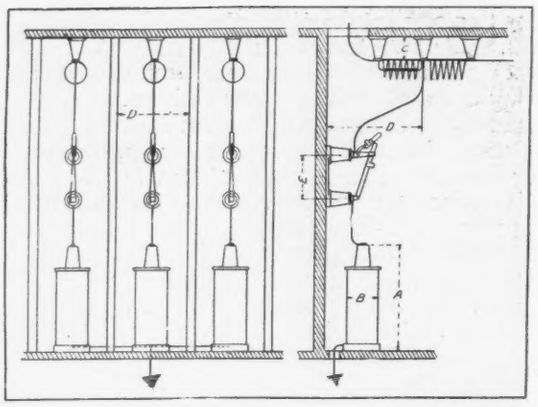
installation of several equipments of this class at various points throughout the line, a marked diminution has been noted in the number of accidents from high-frequency and high-potential causes.

A number of the most elaborate experiments have been conducted with a view of determining the minimum space factor for Dubilier condensers when operated on lines of various voltages. The accompanying table lists the minimum dimensions of the principal parts of the circuit entering into the installation of a 3-phase line for various potentials up to 120,000 volts in accordance with the designations shown on the dimensional diagram.

TABLE SHOWING LIMITING DIMENSIONS FOR INSTALLATION OF STATIC CONDENSERS.

Voltage.		Limiting dimensions in ins. A	B	C	D	E
40,000		47	16			
	50,000			16	55	24
50,000		59	21			
60,000	65,000	78	36	36	66	30
70,000		96	38			
	80,000			32	79	36
80,000		90	40			
90,000		100	44			
	110,000			40	100	..
110,000		100	47			
120,000	120,000	107	51	43	110	..

Another illustration shows William Dubilier, inventor of the mica condenser, and the general construction of a mica static condenser designed



Dimension Diagram for Installation of Static Condensers.

for protecting a 66,000-volt circuit. This condenser is approximately 18 ins. diam. and 70 ins. in overall height, the series of units utilized in this condenser having a maximum capacity of 0.005 microfarads and are immersed in oil. The oil-level gage can be seen at the top of the condenser case in a line with the bottom ground-connecting terminal.

One French transmission line of the Chimins Midi, Paris, suffered from lightning at a number of transformation stations. The lightning continued to strike the line even after the line had been protected with the usual ground-screen messenger wire over the power wires. An accompanying illustration shows an installation of Mosciki condensers at one of the transformation stations, the jars resting against the steel tank at the right-hand side of the illustration have been damaged from the discharge that entered the station.

The difficulties being encountered on this line were studied by G. Capart, one of the foremost authorities in Europe on the subject of transmission line surges and lightning protection, and a system of mica condensers of the lightning protection type were installed at the Horullers and Rondchamp station. The new installation of mica condensers is shown in an illustration accompanying the first section of this article in the Nov. 5, 1921, issue of ELECTRICAL REVIEW. The photograph for this illustration was taken just before the new mica condensers were installed. The containing tanks for the mica condensers can be seen on each side of the cut.

After the new equipment had been in service a short while a direct stroke of lightning was registered about 100 yds. from the station. The discharge was sufficient to somewhat weaken the condensers, but no external damage was caused from flying fragments of metal and porcelain. Attention is called to the fact that, after the discharge had occurred, no damage was caused to the electrical equipment of the station other than a weakening of the protective condensers. This case was reviewed by the transmission engineers of the Chemins de Fer du Midi and an order was placed for 63 complete batteries of Dubilier mica condenser protective equipments for replacement of other types.

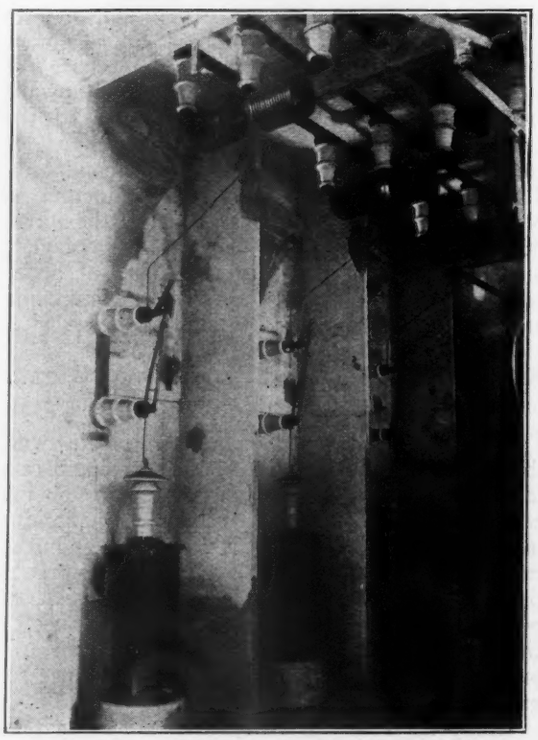
The following is a copy of a report rendered to the officials of Metropolitan Railway Co. by Henri Couquet, engineer in chief of the works and substations, covering the findings of a test conducted to determine the ability of a static mica condenser to relieve a circuit of abnormal transients occurring during a short-circuit. The English translation is reproduced as received from M. Couquet:

TESTS MADE WITH THE CAPART PROTECTIVE APPARATUS AT THE "OPERA" SUBSTATION.

Report of the Engineers of the "Chemins de Fer du Midi"—In the night between July 1 and 2, 1921, the Campagnie du Chemin de Fer Metropolitain de Paris made various tests with a train provided with a modified S. T. A. R. equipment. The program provided for two absolute short-circuit tests, one during normal running and the other while the train was recuperating. In order to avoid damage to the rotary converter feeding the train under test the Metropolitan Railway Co. had asked M. Capart to protect the converter. This converter was a machine of 1500-kw., 550-volt, 250-r.p.m., 12-pole, 25-cycle, 6-phase star construction.

The buffer battery used in every substation of the Metropolitan Railway Co. had been taken out of circuit during the tests. The protective arrangements prepared by M. Capart consisted of a condenser having a capacity of 1 microfarad, placed between the terminals of the machine on the d-c. side. One lamp resistance was fitted to shunt the condenser in order to serve as a discharging resistance for this apparatus. A d-c. circuit-breaking device was placed on the positive pole of the converter.

First test—The train was running normally when a serious short-circuit was effected by means of a special switch between the third rail and the line rails at a distance of about 450 metres (1400 ft.) from the substation. The short-circuit current reached a value of 5000 amperes, which



Installation of Dubilier Condensers on 3-Phase, 50,000-Volt Circuit.

intensity was indicated by a registering ammeter; the high-tension continuous and a-c. circuit-breakers acted suddenly. No flash appeared at the commutator, nor any spark; the lamps forming the resistance showed fluctuations of intensity indicating the discharge of the condenser. After the stopping of the converter I carefully examined, together with M. Capart and the engineers of the Metropolitan Railway Co., the state of the commutator and of the brushes. The commutator was in a state of remarkable cleanliness and had not undergone any blackening and did not show any melting or burning or abnormal rise in temperature, and it was possible to start the machine again without it being necessary even to wipe the commutator. All the 12 rows of brushes were examined with the greatest care, and only one brush was slightly scaled without it being necessary to replace it.

Second test—The train was working under recuperation on the machine when the short-circuit was effected. As in the first test, all the high-tension continuous and a-c. circuit-breakers flew open with a violent force. The short-circuit current indicated by the registering ammeter had reached a value of 5500 amperes, thus exceeding the short-circuit current produced on the occasion of the first test by 500 amperes. The same phenomenon of fluctuations was noted in the discharge resistance lamps of the condenser. The commutator was as little effected as in the first test; no flash and no spark were noted, and the condition of the commutator was the same as after the first test. Some very slight burning was observed on two new brushes, which burning, however, did not make it necessary to replace the brushes.

To summarize, the protective arrangements fitted by M. Capart appears to have given the very best results, although the capacity of 1 microfarad is somewhat low for a machine of 1500-kw. capacity, even in the opinion of M. Capart, who would have preferred to fit a device with a capacity of 2 microfarads. The condenser itself remained in good condition and did not suffer any damage. (Signed) Henri Couquet, Paris, July 4, 1921.

In conclusion, the following advantages of an electrostatic condenser may be enumerated:

(a) It may be installed as a permanent equipment requiring no attention such as charging or refilling.
(b) It is not influenced by moisture or alterations in temperature.
(c) It establishes a dead short-circuit between line and ground for high-frequency currents.
(d) The absence of liquid will permit its installation in any position.
(e) It is free from danger of short-circuits when the power has been removed from the line a few days.
(f) The effectiveness of operation is not influenced by temperature, even when extending from far below zero to some 100 deg. C.
(g) Chemical deterioration is absent, therefore, eliminating renewals of any class.
(h) It functions as a relief valve for all potentials over the rated line value.
(i) It is gradual in operation, thereby eliminating surges caused by sudden release of high voltages.
(j) It reduces the abruptness of the front and tail end of a traveling wave.

Sufficient investigations have not been completed at the present writing to definitely state the capacity required to care for short-circuits of the order listed in the above report, but the findings so far indicate that the recommendations contained in the last paragraph of the report, to the effect that the capacity of the condenser should have been increased to greater values than 1.0 microfarad, is subject to criticism.

Wm. Dubilier and One of His Mica Static Condensers for Use on 66,000-Volt Circuit.

MOVEMENT TO REDUCE LOSSES FROM POOR PACKING.

Various Agencies Working to Induce Shippers to Take Greater Care in Preparing Goods for Shipment by Express, Freight and Mail.

Postmaster Arthur C. Lueder, Chicago, has announced that the U. S. post office department and the express and railway companies have joined in a nation wide effort to stimulate greater interest in the good packing of parcel post, express, and freight packages. November has been selected as the "Perfect Package Month" during which an active campaign will be conducted to induce all mailers and shippers to give their attention to the manner in which their goods are packed, kind of containers used, and the writing or marking of addresses plainly and completely. This is of great public interest because in the end the public must pay the bills for lost or damaged shipments. Therefore, the public should be deeply interested in the campaign.

Christmas will soon be here, and it is especially desirable that care should be exercised in the preparation of packages at this time, because now the occasional mailer or shipper will be sending packages. Articles easily broken should be carefully wrapped in corrugated or shock absorbing paper. The department stores use this kind of paper in delivering breakable articles, and it would be an excellent practice for housewives to save this paper for use when they are sending out their own packages.

Essential Qualities of Oil for Steam Turbine Lubrication

Price of Lubricant Least Important of All Considerations as Savings May Be Lost Many Times Over in Repairs to Machinery — Flash Test and Specific Gravity Considered of Little Value

By J. Y. DAHLSTRAND
Kerr Turbine Co., Wellsville, N. Y.

Next to the governor, nothing about a turbine, gears or high-speed driven unit is as important as the lubrication and the lubricating system. Good or bad lubrication decides whether or not a turbine gives good or bad service, whether or not its operation is attendant with little or great expense, and lastly whether or not it gives satisfaction to the owner.

The first requisite is that the oil used shall lubricate; second, that it shall maintain its lubricating quality; third, that it shall separate rapidly from water; fourth, that it will not deposit any solid substance anywhere in the system to clog it up and thus stop the oil supply.

The price of an oil is the least important of all considerations. Experience has shown that repairs made necessary by poor lubrication would buy several barrels of good oil where one poor barrel has been used. Don't ask the price of an oil until you have found out about all its really important qualities.

A Simple Definition for the Viscosity of Any Oil.

The first item of interest is the viscosity of an oil. This quality is valuated by determining how many seconds it requires for a definite standard quantity of the oil at a standard temperature (usually 100 deg. F.) to pass down through a standard sized opening. A chemist may state it differently, but this gives its simple meaning. It is readily seen therefore that a very thin oil such as kerosene will pass through the opening very rapidly, and we find its viscosity to be about 30. A very thick oil such as heavy cylinder oil has a viscosity of around 600.

The required viscosity is determined by the temperature of the bearing it is to lubricate and also by the pressure on the bearing. A bearing that is lubricated by ring oiling only and that is close to the turbine and subjected to the heat of the steam will require an oil having a high viscosity. The reason for this is that the higher the temperature the thinner the oil; hence an oil having a high viscosity (at 100 deg. F.) will have a lower viscosity at the high bearing temperature.

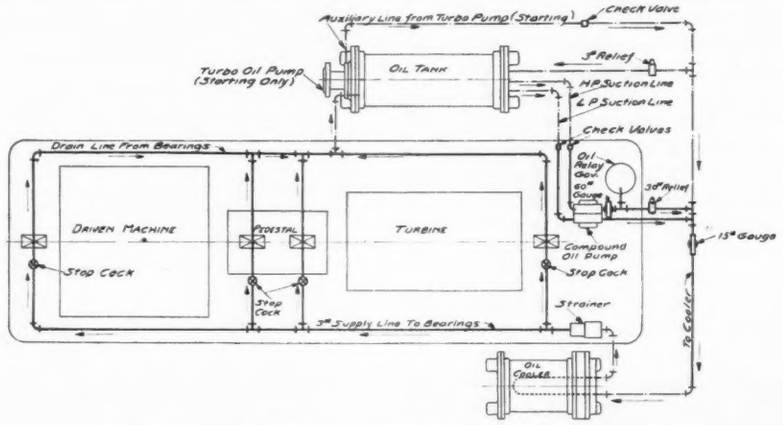


Fig. 1.—Schematic Arrangement of Turbine Oiling System.

In general forced-feed turbine bearings require an oil having a viscosity around 500 (at 100 deg. F.) and it will accordingly be a heavy oil. Note this point, however. It must be a pure mineral oil and not a compounded oil such as is provided for engine cylinders. Compounded oils quite frequently develop acids after a short time and this will quickly destroy the journals, gears and governor parts by making them rough.

Care should be taken when using this kind of oil and running steady each week to carefully clean the bearing case out and put in new oil about once a month. If allowed to run longer it will get thick and the bearings will not be properly lubricated.

The next important quality of an oil is its cold test. When an oil that contains paraffine is refined it is subjected to a low temperature and is then filtered, which process eliminates most of the paraffine. Generally oil is run at about 20 deg. F. to 26 deg. F. during this filtering process. In general, a low test is desirable because the presence of paraffine is objectionable, as it tends to deposit in the oil lines and to clog the system.

The next and very important quality is that of demulsibility or freedom from becoming emulsi-

fied or saponified.* An oil that does not separate rapidly from water is quite apt to form emulsions. A good oil such as would be used for a forced-feed oiling system will settle or separate out from water in about 1 min. or less when allowed to stand.

Tests Required to Determine Quality of a Given Oil.

Such an oil would have a viscosity of about 180 to 230 at 100 deg. F. (Saybolt). A good way to try its quality of separation is to put equal quantities of oil and feed water in a clean bottle and heat up to about 100 deg. F. Then shake the mixture very thoroughly for about 2 min. and quickly set it down and time the separation of oil and water. The oil and water will separate and form two equal portions. The line of separation may be a layer of small bubbles. The period of separation is the time of active separation and not the time it takes for this line of separation to become clear.

After this test the oil should be as clear as before the test—if it is good oil—unless there are very strong impurities in the water used. If the oil looks thick and brownish the test should be repeated with distilled water. If the same result occurs then the oil should be rejected.

The fire or flash test of an oil is of no importance when used on turbine or gear work. Neither is the specific gravity of any importance. When oil is first put into the oiling system put a 2-oz. sample in the bottle and mark it. After a week or two of operation draw off another sample from the oiling system and compare it with the original sample. Let it stand a half day and note any water or deposit that settles down to the bottom. If this sample shows a decided discoloration, a deposit of sediment in the bottom or inability to separate from the water (if present), it is advisable to take the oil out of the unit and put in fresh oil.

Keep taking samples of the oil and thus keep track of its condition. If new oil is put in and it shows the same trouble as the first one or two batches, then try another kind or make of oil or give the first company an opportunity to supply an oil that will make good.

*Emulsibility is the uniting of water and oil into a mechanical mixture of such a nature that the lubricating property of the oil is practically destroyed. Oil while in this condition looks somewhat like melted butter and appears to be full of air bubbles, which is really water. Oil which saponifies really breaks down and forms a thick mass like melted grease.

Oils should be tested for presence of acid if any rust spots are noticed on the shaft in the bearings.

The color of an oil is largely determined by the amount of carbon it contains. The carbon in the oil is removed either by acid or by filtering through bone black or fuller's earth.

Oil that is acid treated (by sulphuric acid) to purify it and make it clear is considerable of a gamble because it is possible the acid may not all be neutralized and hence will journey along with the oil and cause pitting of the journals or the gears and will start a roughening of contact surfaces that will prove very expensive.

Many turbines drive through reduction gears and the wear on an oil is very severe as it is rapidly churned, subjected to heat and thrown off at high velocity, with the result that it is in an ideal condition for active chemical action should any acids or impurities be present.

In general geared units require an oil somewhat heavier than non-geared units. The necessity for this is largely determined by individual conditions such as temperature of the cooling water, temperature of room and degree of cooling obtained in cooler. A large unit carrying a heavy load continually and running with high-pressure steam and superheat will transmit so much heat to the oiling system that a light oil will become very thin and lose its body so that lubrication will be deficient on the whole turbine.

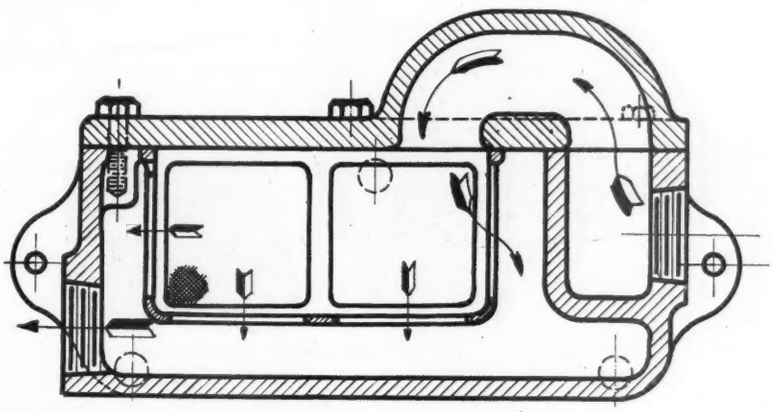


Fig. 2.—Section Through Oil Strainer.

Lubrication Recommendations by Machinery Manufacturer.

With reference to recommendations of lubricating oils for use with turbines and gears, our policy is as follows: We do not recommend any grade of oil in the sense we guarantee its quality and assume responsibility for results obtained. We have no interest in the matter whatever other than the satisfactory performance of our apparatus. Our practice has been to send with our turbines a free sample of oil. These sample cans have up to the present time been furnished us by a leading oil company. Because of the fact that different turbines and turbine-driven machines require different grades of oil, some very thick oil, and others thin, it has been deemed advisable to continue sending these sample cans as insurance against a mix-up on the grade of oil by the customer, which mix-up might prove disastrous to the turbine.

We wish to state regarding these samples of

oil that we consider these particular makes well suited for the turbines and that they have given us in general good satisfaction. We do not, however, guarantee them. We also wish to say that in our opinion equally good oils can be purchased from other makers.

Fig. 1 is a schematic arrangement of the oiling system used on a turbine. The diagram shows the relative positions of the main parts in the oiling system. The arrows indicate the direction of oil flow. Valve A is a 30-lb. relief valve. Valve B is a 5-lb. relief valve. The lubricant is pumped from the oil tank by three oil pumps as follows:

1. Auxiliary turbo oil pump which is only used when starting or stopping unit.
2. Low-pressure oil pump.
3. High-pressure oil pump.

The two latter pumps are of the geared type and fit in a common casing. The former supplies oil to bearings, the latter to the oil relay governing system.

Excess oil from high-pressure pump will be returned through a 30-lb. relief valve to low-pressure system.

Excess oil from low-pressure system will be returned by 3-lb. relief valve to oil tank.

An oil strainer and cooler are located in the oil supply lines.

Auxiliary Oil Pump and Its Operation and Use.

The auxiliary oil pump as shown in Fig. 1 is usually fastened to the bedplate or a separate oil reservoir. The pump is centrifugal in action and is driven by a small single-stage turbine of the Pelton wheel type. The pump is capable of building up a pressure of 3 lbs., which is sufficient to supply oil to the bearings. It must be operated when starting or stopping the main turbine.

To operate pump, open all valves on oil system. Open steam inlet valve on small oil pump turbine and if oil gage shows a pressure of 3 lbs. and sight glasses indicate a flow of oil through bearings, the pump and oiling system is all right.

When auxiliary pump is in operation and main turbine is getting up to speed, note whether supply of oil through sight glasses in oil system is sufficient. By means of two stop valves in system near pumps, the oil pressure and supply can be controlled. When speed is obtained on main turbine, turn off auxiliary pump and note if the oil pressure and supply continue. Supply and pressure of oil should be obtained at all times when main turbine is operating. The oil cup on the turbine should be kept filled with cylinder oil.

To remove oil pump, draw off all oil from reservoir. Disconnect discharge pipe on pump and take off piping on the small turbine. Remove set screws from steam end and cap screws from the side of reservoir. Pull off steam end and pull the unit away from bedplate of reservoir This opens up turbine and pump for inspection.

The oil passes from the oil pump through the oil cooler tubes. These tubes are set into a tank of cooling water. The water is supplied to the bottom of tank and flows out the top. The oil circulates through the cooler tubes with considerable velocity, but remains in the cooler for a sufficient length of time to be properly cooled. During its passage through the tubes, the oil is kept stirred by twisted baffles which prevent the oil from flowing in parallel streams through the tubes. The result is that all of the oil comes into contact with the tube walls and hence is efficiently cooled.

It is important that the cooling water be piped into the cooler as indicated. A reverse flow of water will not give as satisfactory cooling as when the coolest water first comes into contact with the coolest oil.

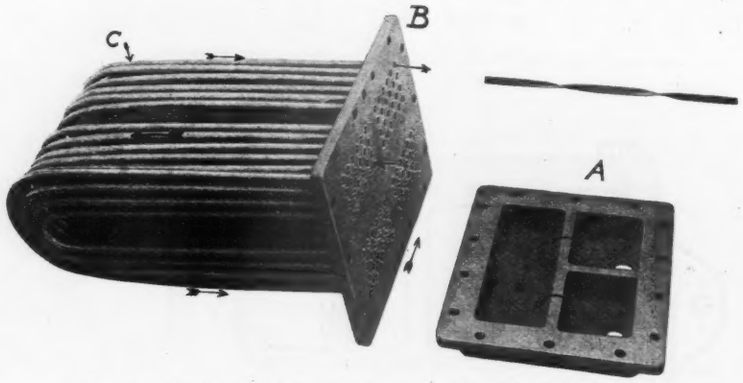


Fig. 3.—Oil Cooler Tubes—Cover and Circulating Strips.

The water compartment should be frequently cleaned out if the cooling water is not perfectly clear and clean. Even if the water is clean, it is desirable to clean the cooler at least three times a year. All tubes should be cleaned both inside and out, taking care to correctly reinstall the baffles. The best way to clean the tubes is to blow them out with air under high pressure, then run a flexible wire through each and pull a cloth through. If the cloth alone does not clean them out well, it may be necessary to wrap a piece of fine brass gauze around the cloth and drag that through. It will effectively clean the surface.

Latest figures on water power applications, filed with the Federal Government, show a contemplated new development of 14,000,000 hp., which indicates the increased demand for electric power. This would be sufficient to furnish power for 22 cities, the size of Chicago, it is estimated.

A number of the smaller cities and towns of Oklahoma are extending lighting facilities to their alleys. The town of Hennessey, through its commercial club, is planning the installation of electric lamps in alleys of the business district.

Electrically Operated Equipment for Car Handling

Interlocking and Limit Control Switches Employed to Assure Proper Sequence in Cycle of Movements—Great Saving in Labor and Increase in Plant Capacity Secured by Electrical Operation

By R. M. KINTZING

Control Engineering Department, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

The northern central grain elevator of the Pennsylvania Railroad Co., at Baltimore, Md., has a grain-storage capacity of approximately 5,000,000 bu., only half that of the largest Canadian storage elevators, but in grain-handling capacity it is twice as large as any other elevator. Located on the harbor front, its piers can accommodate five ocean-going vessels at one time. It is equipped with the latest and most modern type of machinery designed for the most efficient handling of bulk grain.

Foremost among the many labor- and time-saving devices are the grain-car dumpers in the unloading room. Four of these machines, side by side, with an operating crew of 18 men can unload 400 cars daily, each car containing from 1200 to 2000 bu. of grain. The average is 25 to 30 cars per dumper in each 8-hr. shift with only three men actually assisting in the dumping operations. Prior to the installation of these machines four men were required to unload eight cars per such 8-hr. shift. During the operation of unloading 314 cars it was observed that one-third of them were unloaded completely in 8 min. each.

These facts become more impressive when it is remembered that grain is shipped in standard size box cars with side-opening doors and separate wooden grain doors, usually nailed to the framework of the car. After the doors are opened the car is emptied by tilting it in several directions to permit all of the grain to flow out of the car door. Small cars are tilted once each way only, and large cars are tilted twice.

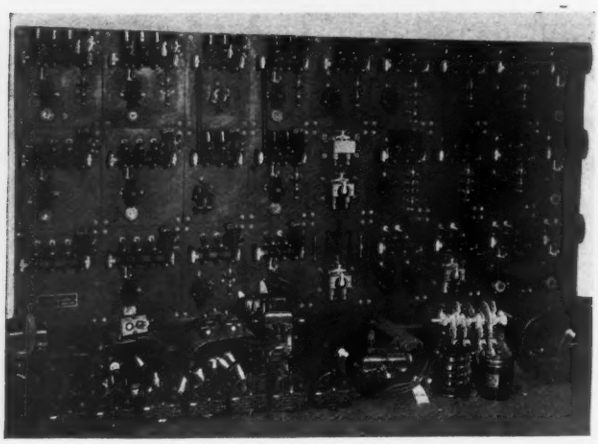
The car dumpers were designed and built by the Link Belt Co., were installed under the direction of Jas. Stewart & Co., Inc., grain elevator contractors, and were made unusually heavy because they were required to sustain the weight of locomotives passing over them. They consist of a bridge approximately 60 ft. long supported on a large central shaft in trunion bearings and arranged to be tilted 45 deg. in either direction endwise, and 30 deg. sidewise in one direction. Automatic means for clamping the cars in place on the bridge are provided at the ends and sides of the cars, and automatic means of opening and lifting grain doors are included. A motor-operated car puller is used to pull up a string of loaded cars and to spot the cars in the center of the bridge.

General View of Grain Unloading Room, Showing Bridge, Operator's Cage and Other Features.

View of Car Dumper, Showing Door Pusher and Side Bolsters.

Each cycle of operation begins with the bridge horizontal, with end posts under each end to prevent endwise tilting, with end clamps depressed below the level of the track to permit cars to be run onto the bridge, and with side clamps and door openers hacked away from the bridge in extreme positions. The operator manipulates the car puller to pull a car to the approximate center of the bridge. The end clamps are then run up against the bumpers. The end-clamp motors drive the clamps through screws and travelling nuts and are stopped by current-limit relays when the clamps have exerted sufficient pressure against the couplings to stall the motors. After the end clamp motors have been stopped in this manner it is possible to operate the side clamp motors, one at either end of the car, to push out the side clamps which are intended to support the car as

it tilts over sidewise. Current-limit relays are also used to stop these motors, and after the motors have been stopped in this manner it is possible to run the door opener forward to push in the grain door. The car door has been opened previously to prevent damage to the car. The original layout included a motor and control for



Control Panel, With Auxiliary Control Apparatus, for Car-Dumping Machine.

lifting the grain door above the floor of the car to permit escape of the grain before the car was tilted. This motor was not used, however, and the door is lifted manually by means of levers.

Car Tilted in All Directions by Motor-Operated Device.

Lifting the grain door permits grain to begin to flow out of the car, and in order to accelerate this flow of grain the car is tilted 30 deg. sidewise at which time the electrical circuits are completed which enable the operator to remove the end posts and to tip the car 45 deg. endwise. The car is tipped to the other extreme position and then restored to a horizontal position and unclamped by the reverse of the cycle just described.

When the car has been entirely emptied the end post under the elevated end of the bridge is inserted and the bridge is started down toward that end. Insertion of the end post brings into operation an auxiliary limit switch which causes the bridge to slow down and stop in the mid or horizontal position, at which time the other end post is put under. The car is then restored to a horizontal position and unclamped by first removing the door pusher and side clamps, and is pushed off the bridge by the next loaded car.

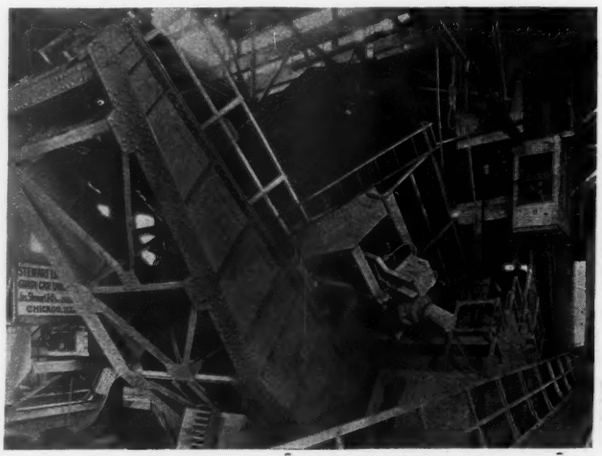
All the operations are completely interlocked so as to make it absolutely necessary to adhere to a predetermined cycle of operation, and any departure from this predetermined cycle immediately makes the control inoperative and makes it necessary for the operator to hold down certain push buttons while correcting faulty operation and restoring the action of the control to its previous conditions.

The power is supplied from a 3-phase, 25-cycle, 550-volt, a-c. circuit, and the motors used are of both the squirrel-cage and the wound-rotor induction type. The main controllers are in the form of switchboards on which are mounted the necessary magnetically operated contactors, relays, etc. The operator's switches are small drum-type controllers, one for each operation of the dumper. All of this equipment must be inclosed in order to avoid the chance of dust explosions. All of the limit switches mounted on the dumpers are inclosed in dust-proof boxes. The wound-rotor motors with exposed current-carrying parts are covered, and the control panels are mounted in dust-proof houses at the top of the unloading room where they are farthest removed from the source of dust.

A general view of the unloading room is given in an accompanying illustration. The dumper in the foreground is in position to receive a loaded car, the end clamps are down in the pits beneath the track level, and side bolsters and the door pusher are backed out to their limits to avoid striking the approaching car. At the right near the center is the top of the hopper into which the grain is poured. The operators' compartments are built out from the columns at the side of and above the dumpers to give the best possible view of the unloading operation. The controller houses are directly above the operating rooms. This view shows also the construction of the side bolsters and door pusher. The top part of the bridge, on which are mounted the end clamps and side bolsters, is a cradle which is rotated on the rollers shown in the left foreground to tilt the car sidewise. The door pusher does not tilt with the cradle, but is pushed out securely against the grain doors and removes this door on account of the relative motion between the door pusher and the car as it tilts sidewise.

A car is shown in another illustration clamped in the cradle and tilted to the extreme side position. The end clamps rise out of the pits as they are pulled forward, and when they strike the car couplings they continue until the pressure exerted stalls the end-clamp motor. A current-limit relay on the control panel disconnects the motor after it has been stalled. Prior to this, due to interlocking of the control circuits, no other part of the dumper can be operated and after its occurrence only the side bolsters can be moved. There are two of these, one at each end of the car. Both must be moved out against the car, and both operating motors must be stalled before any more of the control is energized.

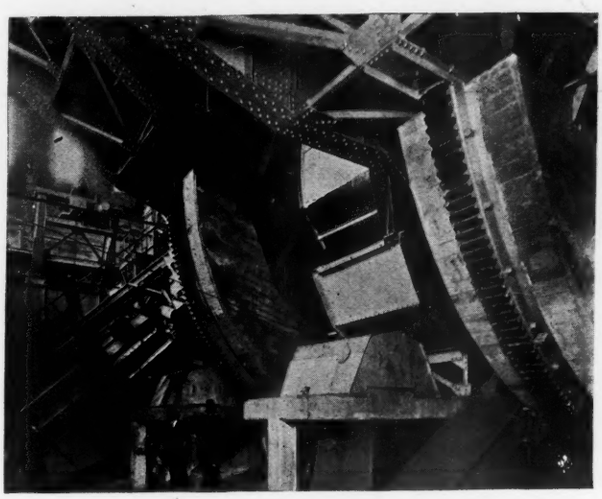
Both the end clamps and the side bolsters may



Car Tilted, Showing Bridge Mechanism and Part of Concrete Counterweight.

be run back and forth as often as desired before they are stalled, but after either one has been stalled and the succeeding operation has been started an attempt to operate either of them will immediately de-energize all the control and effectually prevent unclamping the car when it may be in an unstable position. The same idea is carried out in the complete cycle of operation and is effective in both directions; i. e., whether the car is being clamped and unloaded or being returned to normal position and unclamped. To restore normal conditions the operator must hold down push buttons at some little trouble until he has corrected his mistake.

When the side bolsters have been stalled the control for the door-pusher motor and the side tilting motor are energized. Then the door pusher advances, strikes the grain door, pushes the boards into the door, and stops automatically.



Under Side of Car Tilting Mechanism, Showing Gears and Motor Cover.

Car Tilted Endwise, Showing Inclined Position of Platform.

The car tilts sidewise until stopped by the opening of a geared limit switch controlled by the side-tilting motor. The same limit switch establishes a circuit which releases magnet-operated latches on the end posts and thereby makes it mechanically possible for the operator to remove these end posts.

Switches operated by the removal of the end posts complete the circuit for the end-tilting control and permit the bridge and car to be tilted endwise. A geared limit switch automatically causes the tilting motor to slow down and stop at the extreme positions. A 2-speed induction motor is used for this purpose. A slow-speed connection is useful in giving a positive "slow down" before the bridge comes to rest and the brake is set. In practice it is always tilted first in the direction which lifts the counterweight. Then the weight is able to assist in moving the unbalanced load of the partly empty car in the other direction.

When the car has been emptied and it is desired to stop the bridge in the horizontal position the operator replaces the end post under the elevated end of the bridge. This action cuts in an auxiliary limit switch which automatically slows down and stops the motor when the bridge is approximately horizontal. Exact spotting, level with adjacent tracks, is done from an "inching" push button which is effective only when the bridge is nearly in place on the end posts. When the operator replaces the second end post the side-tilt control, which is de-energized as long as either end post is removed, is again energized and the car may be brought to a level position. When it reaches this position other contacts on the side-tilt limit switch re-establish the circuit for the side bolsters and door pusher. These, in turn, when they have reached their extreme position away from the car, re-establish the circuit for the end-clamp control and the car can be completely released. From this point it is pushed off the bridge by the next oncoming car.

It will be seen from this description that exacting interlocking requirements have been met. No operation can be started until the preceding one has been completed. The value of the precautions taken is emphasized by the entire freedom from accidents while handling cars. So perfectly has the interlocking been worked out that the complete cycle of unloading, when once started, may be automatic. All that is necessary is for the operator to put his control handles into the running position. If desired, he could move all handles at the same time. The interlocking would assure correct functioning of all parts of the equipment through an unloading cycle.

A French engineering company has solicited a concession from the Republics of Argentina and Uruguay for the construction of a hydroelectric station at the falls of the Uruguay river which separates Uruguay from Argentina. The proposed plant would furnish electric power to all of the territory within a radius of 375 mi. of Salto Grande and would include the principal cities and about three-quarters of the population of Argentina.

More than 35,000 people, nearly all of whom are Bell Telephone subscribers, have become stockholders of the American Telephone & Telegraph Co. during the last year. There are now over 170,000 stockholders, and bond owners probably exceed 100,000 in number in addition.

ENGINEERING EXPERIMENT STATION AT UNIVERSITY OF ILLINOIS

Scientific Research Carried on for Benefit of Industry in General by Institution Provided by the State.

Until recently, comparatively few of the engineering industries appreciated the value of research. Now most of them are alive to its importance and many of them have undertaken its promotion by one means or another. A few of the large industrial organizations have developed splendidly equipped research laboratories devoted to the solution of problems of fundamental importance to their own interests and not infrequently to the advancement of pure science. Other organizations have developed laboratories ostensibly devoted to research but really devoted to routine testing incident to the manufacture of their product and to the development of new machines, products, or processes. During recent years, a considerable number of trade associations have been organized to study and promote the interests of the firms having membership in these associations, and in many of them important research work has been undertaken in laboratories which they have developed, or in co-operation with private or public laboratories.

It is difficult to determine when a single corporation or an association of concerns having a community of interests is justified in organizing an independent research laboratory. The great expense incurred in the operation of such laboratories, the difficulty of securing properly trained and competent men to do research work, and the failure to recognize the nature of the problems to be solved are likely to bring many of these laboratories, as well as research in general, into disrepute. In many instances, more satisfactory results may be obtained at a smaller cost through co-operation with private or public laboratories.

The Engineering Experiment Station of the University of Illinois, the first of its kind in existence, was created by an act of the Board of Trustees on Dec. 8, 1903, in recognition of the need for more accurate knowledge of the materials and processes of engineering, and the conservation of those resources upon which the engineering industries depend. The Station has been helpful in stimulating engineering education and it has rendered a distinct service to professional engineers and to the industries of the State and Nation.

The management of the Engineering Experiment Station is vested in an executive staff composed of the director and his assistants, the heads of the several departments of the College of Engineering and the professor of industrial chemistry. This staff is responsible for the establishment of general policies governing the work of the Station, including the approval of material for publication. All members of the teaching staff of the college are encouraged to engage in scientific research, either directly or in co-operation with the research corps, composed of full-time research assistants, research graduate assistants, and special investigators.

Each department of engineering represented has been initiated by members of the teaching and scientific staffs, and which is carried on by them with funds regularly available for the work of the Station. Most of the investigations thus far completed by the Station have been financed with university funds. In general, the investigations thus undertaken are such as have a peculiar appeal to these members of the staff because of their knowledge of the need for reliable information in particular subjects, resulting from their own professional experience or study, and their desire to secure it. Such work is particularly stimulating to teachers of engineering subjects, and it is generaly valuable to professional engineers and to the industries.

Circular No. 9 has been issued by Director Charles R. Richards explaining the importance of the Station to the engineering, manufacturing, railway, mining and other industrial interests of the state.

PLANS FOR NEW STATION OF LARGE CAPACITY.

Tract of 85 Acres Set Aside for Erection of Generating Plant by Public Service Co. of Northern Illinois.

For some time past tentative plans have been under way for the construction of a generating station by the Public Service Co. of Northern Illinois at the northeast limits of Waukegan. Property comprising about 85 acres, located on the lake, has been purchased for this new development. A pond of about 10 acres on this property, supplied from the lake, provides an economical method of securing condensing water for the turbine units and eliminates the expense of constructing an intake out into the lake. Adequate rail facilities are also available for the delivery of coal to the storage yard which is planned to be sufficiently large for storing a 90-day supply.

The initial station development will consist of two 20,000-kw. turbogenerator units with necessary boilers, condensing equipment and electrical apparatus, following in general the layout of the new Joliet steam station No. 9. The ultimate development is planned to be for 220,000-kw.

Electrical energy generated at this station will be transmitted from an outdoor switch yard over a double steel tower transmission line. Each tower will be designed to carry two 132,000-volt circuits, each circuit having a capacity of 35,000 kv-a. The towers will be about 80 ft. in height and spaced 750 ft. apart. A double line of such towers together with the necessary space for distribution pole lines makes it necessary to provide for a right of way of considerable width. Negotiatlons for securing such a right of way are already in progress and a portion of it between Evanston and Highland Park has been secured. When completed these transmission lines will connect the new Waukegan station with the Northwest generating station of the Commonwealth Edison Co. thus providing for an interchange of energy.

Just when actual construction work on the new station will be started cannot now be stated. A great outlay is involved and thus the financial situation as it develops becomes an important factor. But it is hoped a beginning may be made during the year 1922.—Public Service Co. of Northern Illinois *News*.

EDITORIAL COMMENT

The Small Plant

Economy of operation is just as important in the small plant as in the large one. There is no excuse for the waste of fuel or the waste of heat through the use of poor equipment or because of improper maintenance. On other pages of this issue, J. J. Brennan, of the Northern States Power Co., tells of some of the things that can be done to improve the economy of the small plant. His suggestions are not simply a fine array of words without a real meaning; they are vital to the welfare of the plant owner, and they have a meaning that will reflect in the annual record of profits if followed.

Dirty boilers, dirty flues, leaky settings, leaky valves, bare pipes, defective grates or stokers, lack of interest and lack of information in the boiler room are a set of thieves that come in through the open door of neglect. The boiler room is being neglected when the manager does not insist upon having daily records of operation which he understands and makes use of. The men in the boiler room will have a keen interest in the records made if they understand that the "big chief" examines every chart and log sheet with a critical eye that sees the good as well as the poor results. With interest alive it is a fairly easy matter to get good operating performance from the men, and with good equipment the men will get good results from the coal pile.

The Brennan commandments may be condensed as follows: Install instruments enough to find out what the plant is doing and what the men can do with it; study the results obtained in the light of the records obtained; apply the remedies that are required, and keep at it.

Business

The question as to what is the matter with business has been heard on every hand, and many answers of one kind or another have been made to this vital question. The following item taken from *The Corn Exchange* gives an answer worthy of consideration:

"It is surprising how many customers tell us that business is active. Of course, there are some others who report considerable depression, but the general average is rising. Signs are multiplying that business is on the upgrade. Gradually the opinion that prices have seen their lowest in some lines is becoming a conviction, and it seems that the tremendous stocks of gold held by this country will be used as a lever to force prices up. In any event, business is slowly improving. It may improve much faster as it gains momentum.

"Are we going to have another period of deflation? All history says that business liquidation and cheap money foretell a period of expansion and overinflated values. We have the federal reserve system to act as a break on that condition, but it did not prevent it after the armistice. Why worry about something that may never occur. What we are all concerned about now is the revival of good times, and it begins to look more and more as if we are at the dawn of a better day in business. The federal reserve rediscount rate, however, seems at variance with actual money conditions. A great deal of liquidation has yet to be effected. Undoubtedly, a good stock market, a lowering of rediscount rates and still lower rates on treasury bills act as a stimulant. With the turning point reached in the foreign situation it is quite likely that business in this country will go forward much faster. The Administration seems fully alive to its responsibilities and has already done much to bring about a feeling of confidence on the part of the business interests. Unfortunately, the proposed tax bill is the result of compromises and is not satisfactory. Give us a law like that in Canada with a fixed tax on manufactured product—uniform, simple and inexpensive in its application."

The Conference at Washington

The world awaits the issue of the conference of statesmen now under way in Washington and wonders what will be the outcome. Will it relieve the nations of their ever growing burden of expenditures for tools and implements of destruction, or will it plunge the world into another contest greater than the one just finished? This is a question that is now uppermost in the minds of more people of all races, classes and ages than probably any or all other serious problems. The cost in human lives that would be squandered in another conflict such as that just ended vastly outweighs anything that the price in money and materials might be. But the price in money is itself a very enormous one.

In round numbers this country is about 3000 mi. across and 2000 mi. from north to south, having something like 6,000,000 sq. mi. of territory. We have talked a great deal about supplying electric service to all the people of the coun-

try, but have been at a loss as to where to find the money to finance the great construction plan required by such an undertaking. It is fair to assume that if, say, 3 mi. of line were built across each square mile of territory practically every individual in the United States would be within easy reach of service. Considering the great sections of country that are practically unpopulated it seems evident that a proper arrangement of such an amount of transmission and distribution equipment would reach every home in the entire nation.

The building of 18,000,000 mi. of line is an enormous task to contemplate, and its cost would approach something near the sum spent in money by this country during the great conflict, but every dollar would be a dollar spent for progress, happiness and prosperity. After the job was completed it would represent an achievement worthy of a great people. It is not probable that there would be an immediate need for 18,000,000 mi. of line, but there is an immediate need for a great many thousands of miles of line and for a great many thousands of kilowatts in station and substation capacity for replacements and extensions in regular service. There is also a great need for new lines, new generating capacity and new equipment for railroad electrification. There are a great number of other things to which the electrical industry can turn to absorb any or all capital that may be released as a possible outcome of the present conference.

Restoration of productive business activity, together with the lessening of burdensome taxation of all kinds, would go far toward a solution of employment problems, transportation problems and problems of credit. The electrical industry must prepare itself to take advantage of any opportunities that may be opened up as a result of the conference, and must stand ready to do its share, as it always has in the past, in building for prosperity. Only a lack of courage and vision can hamper us, and a lack of such qualities has never been a fault of electrical men. Let us not fail now.

Accidents

Any efforts on the part of an electric utility to educate its employes in accident prevention should be accompanied by efforts to properly safeguard all operation and construction hazards. Fortunately, the electric utilities realized long ago the vital necessity of making ample provision for protective devices. Today, no other industry can show such a concerted effort to prevent accidents through the use of safeguards. Nevertheless, accidents continue to occur daily due in many cases to the absence of sufficient safeguards.

The safeguarding of high-voltage equipment appears to have been perfected to a higher degree than the safeguarding of low-voltage apparatus. This is necessary for the hazard is greater with high-voltage equipment than with low-voltage equipment. However, the proper protection of low-voltage equipment should not be ignored, for the accident figures compiled by various associations and insurance companies show that the most productive source of fatal electrical accidents is the low-voltage hazard. This situation can no doubt be partially attributed to the present lessened consideration for the danger of low-voltage systems and equipment. An analysis of the low-voltage accidents discloses that most of them have occurred in damp places on circuits varying from 110 to 500 volts. The elimination of this hazard necessarily must be done through methods consistent with a due regard for service and common sense. It could no doubt be eliminated to a considerable extent through the proper grounding of dead metal parts of electrical apparatus, and the removal of all open wiring, switches and brass sockets in well-grounded places.

The exposure surrounding high-tension equipment seems to be of a more limited nature than that surrounding low-voltage equipment. More consideration appears to have been given the protection of high-tension equipment than the safeguarding of low-tension apparatus. Notwithstanding this fact, a state of perfection has not as yet been reached in averting accidents due to high-tension exposure. Stations, substations and equipment are still being designed and installed where the element of exposure to high tension is present. Sometimes these installations are of a temporary character and are usually excused from that standpoint, but the fact that an installation is of a temporary nature does not eliminate the hazard, for such installations are a prolific source of accidents.

Some companies are tolerating operating practices today which are absolutely unsound and unsafe. The practice of cleaning insulators on high-tension circuits is extremely dangerous. Operating experience has shown that there is no imperative necessity for continually cleaning insulators on live circuits; consequently, it should be stopped. Another practice tolerated by some companies, which is beyond the realms of safety, is the custom of working on ungrounded high-tension lines. Grounding devices should always be used on such work despite the fact that such lines are supposedly dead through open circuit-breakers and switches. Grounding devices may be easily constructed for such purposes and should be distributed over the company's system where they are most likely to be needed. The lack of

frequent and regular inspection of all equipment and inadequate maintenance are contributory causes of many accidents which are sometimes laid to secondary causes. The custom of using substations and stations for storage purposes is a prevalent source of accidents and should be emphatically prohibited.

The foregoing explanation of the company's part in preventing accidents should make it quite clear that every electric utility has certain well-defined duties to perform in the accident prevention movement. The responsibility resting upon the company in the movement to avert accidents is probably exceeded by the responsibility resting upon the foreman and the employe.

The foreman's duties in accident prevention work cause him to be the key man for the execution of all safety plans between the company and the employes. The foreman should be the leader of his men in thought and action on safety questions. His enthusiasm and interest in accident prevention should permeate his department, thus informing indirectly his employes that it is to their best interests to be interested in the prevention of accidents. The foreman should exercise the closest supervision over all hazardous work and frequently inspect tools and equipment. He should impress upon the workmen the necessity of making safety an integral part of their daily work and especially point out to new employes the particular hazards surrounding their work. Every foreman has three things to keep in his mind; namely, safety, service and cost.

The employes should have it firmly impressed upon them that their support and co-operation are absolutely necessary for the success of the "Safety First" movement and that it takes more than safeguards to avoid accidents. Every employe should have it instilled into him that sufficient safeguards will never be available for the habitually careless worker and that the best safeguard is personal caution.

The above comments taken from a paper by Paul R. Kuhn of the Penn Central Light & Power Co., Altoona, Pa., presented before the Pennsylvania Electric Association, call attention to the vital importance of continual alertness in the prevention of accidents. Many of the unfortunate things that do take place might have been easily averted by a little forethought, so it is always opportune to review such comments as those made by Mr. Kuhn. Accidents are always to be regretted, and particularly so when they might have been avoided by a little forethought.

Electric Cooking

An item appearing in the current issue of *The Electrician* (London) throws some light on the advances being made in England in the use of electricity for cooking purposes. The article follows:

"The extension of the B. and K. restaurant at Kensington and the installation on one of the Great Northern railway dining cars of an electric cooking equipment, mark the progress which is being made in the use of electricity for culinary purposes by those whose first object is commercial rather than technical success. The Great Northern installation, it is true, is not absolutely the first application of electric cooking on railway trains, but it is sufficiently novel to be worthy of note, and at the same time is a recognition of the fact that by using electricity it is possible to provide meals under the arduous conditions of restaurant car working. We may go further, and say that electric cooking is especially suitable for this class of work, for it enables palatable meals to be prepared in a pure atmosphere, and allows the temperature of the car itself to be kept at a comfortable level—a point which is not without its importance both to the staff and to the passengers. We are therefore not surprised to hear that the cooks are enthusiastic about it. It will also enable the possibilities of electric cooking to be explored by those who are not electrical experts, but are sufficiently well versed in the culinary arts to make their experience worth having.

"The B. and K. restaurant is interesting in another way. In it cooking will be carried out under ideal conditions by those who have been educated in the possibilities of electricity for some considerable time. It will show both the frequenters of the restaurant itself and that increasing number of Kensingtonians who purchase cakes and other confectionery for home consumption the pastry it will be possible for everyone to make when the all-electric home becomes a universal experience rather than a too infrequent dream.

"The restaurant will do something else. The results obtained, both electrical and culinary, will be carefully measured and analyzed by Mr. Downe and his assistants, not only to find out weaknesses in the equipment, but to obtain figures of the actual cost of electric cooking and of the energy consumption of the various apparatus. These figures cannot fail to be of the greatest use, and we hope they will be made public for the confounding of critics. It is almost a proverb that science is measurement, and we may admit that cooking is a science. It therefore logically follows that cooking is measurement, and this opens a new area of the greatest possibilities. The whole enterprise is one that reflects the greatest credit not only on the directors of the company, but on R. S. Downe for his indefatigability and enthusiasm."

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

STANDARDIZATION WORK OF LIGHTING FIXTURE MANUFACTURERS.

"Giving 'em Fits" is the specialty of Mr. D'Olier, the standardization engineer of the National Council Lighting Fixture Manufacturers. For several months he has been steadily at work interviewing lighting fixture manufacturers, investigating present locally used standards, and from the information thus obtained evolving a standard which will retain the advantages of those already in use, while at the same time causing as little inconvenience as possible. The idea behind the National Council's plan is not to create an entirely new set of standards set up by Mr. D'Olier, but to take something which lighting fixture manufacturers have already proved to be effective through years of experience and then to make that a standard for the entire trade. As a matter of fact you cannot set up a permanent standard in any other way, because people won't use it if it is not practical.

The advantage of this standardization to the fixture dealer is undoubted. It will eliminate sloppy fits, noninterchangeable screw threads, and other troubles which so often occur under present conditions. It will enable one manufacturer to draw upon another for parts in order to deliver rush orders. And last, but by no means least, it will mean better fixtures and therefore more business for the lighting fixture manufacturer.

SEATTLE BUILDING PURCHASED BY WESTINGHOUSE COMPANY.

Property Acquired to Provide Facilities for Assembling and Testing Electrical Machinery, Switchboard and Panel Manufacture, Etc.

The Westinghouse Electric & Manufacturing Co. has announced the purchase of the manufacturing building of the Kilbourne & Clarke Manufacturing Co. on the Seattle waterfront, for a consideration of $130,000. Acquirement of this property will provide facilities for assembling and testing electrical machinery, the manufacture of switchboards and panels, warehousing of its products, and the housing of its sales organization.

H. P. Davis, vice-president of the Westinghouse company, and in charge of operations, and W. K. Dunlap, acting vice-president, made a survey of Pacific Coast cities late in 1920 and have chosen Seattle to establish the first assembling plant on the Pacific Coast. This city is served by four American and one Canadian transcontinental railroads, has fast boat service to British Columbia, Alaska and California, and is also the nearest American port to Japan, China and the Philippines.

The company will ship quantities of unassembled apparatus from East Pittsburgh, Pa., to Seattle and here assemble and test the apparatus as it is applied on orders. The company anticipates that the future demands will be largely increased due to the rapid growth of the electrical business on the Pacific Coast. The company's attitude is understood to be that the time is not far distant when it will be necessary to manufacture apparatus on the Pacific Coast. The Westinghouse company has its main plant in East Pittsburgh and other plants in many cities, among which are South Philadelphia, Pa.; Newark, N. J.; East Springfield, Mass.; Cleveland, and Mansfield, O.

The Kilbourne & Clarke Manufacturing Co. plant purchased by the Westinghouse people had a most rapid growth during the war when it received big government contracts for wireless sets and other apparatus. Its plant is considered a model one and the Westinghouse people purchased it at a very nominal figure. The Kilbourne & Clarke Co., which was employing 150 mechanics at the time of transfer, will continue in the industrial field at Seattle and will erect a suitable plant for the concern's need, and will engage in a general electrical equipment manufacturing business. The plant was unsuited for the afterwar program of the concern and the need of a new plant led to the sale to the Westinghouse corporation. No definite plans for the proposed new plant have been made, but officials of the company will seek a suitable site and proceed with construction as soon as possible.

One-sixth of the potential waterpower of the United States is in the state of Washington and one-tenth of the nation's potential waterpower is within 200 mi. of Seattle. There has been a lively demand for electrical apparatus in the state of Washington and the Pacific northwest generally. The new Westinghouse plant at Seattle will distribute to California points as well.

WASHING MACHINE DEMAND SHOWS STEADY IMPROVEMENT.

The American Washing Machine Manufacturers' Association held a meeting at the Sherman hotel, Chicago, Nov. 16-17. A discussion of business conditions showed that the demand for washing machines was on an upward trend and there has been a steady improvement on all types of machines since July 1. The delegates were of the opinion that the bottom was reached in midsummer and that from now on business will be

Milwaukee is planning a great week of activity for the entire Lighting Industry — The dates are from January 30 to February 4, 1922 — ARE YOU GOING?

good. Reports show that the present volume is equal to 1919 business.

Joseph F. Beek, executive secretary of the National Industrial Traffic League, spoke on the railroad problem and its relation to industry. Wednesday afternoon's session was devoted to a discussion of export trade. Pictures showing the manufacture of various washing machine castings in the foundry was a feature of the session. Thursday morning's session was of an executive character.

PLANS FOR A. I. E. E. MIDWINTER CONVENTION.

The 10th midwinter convention of the American Institute of Electrical Engineers will be held in New York City, Feb. 15-17. This will be the first meeting in 1922 under the new policy adopted by the board of directors which prescribes four general meetings of the Institute each year including the annual convention. While a definite program cannot be announced at this time, the Meetings and Papers Committee has in hand several papers which have been accepted and is prepared to consider for this program any further manuscripts which may be received prior to Dec. 15.

PLANS FOR MILWAUKEE LIGHTING FIXTURE MARKET.

Events During Joint Convention of Three Associations to Include "Better Lighting Week" and "Pageant of Light."

"The market that makes Milwaukee electrically famous"—That is what lighting fixture makers and dealers, and everyone else who is interested in better lighting—and which of us is not?—will be saying from now till Jan. 30, and for a long while afterwards, too. For on Jan. 30 the National Council Lighting Fixture Manufacturers, the Dealers' Society of America and the Illuminating Glassware Guild will hold their third annual Lighting Fixture Market and their second joint convention at the Milwaukee Auditorium. From Jan. 30, right up to the closing date, Feb. 4, there will be "something doing" every minute. The mornings will most probably be devoted to the convention meetings and the afternoons to the Fixture Market, just as at the highly successful Fixture Market at Buffalo last February.

In addition to the above-mentioned events there is to be a "Better Lighting Week" to be held during the convention. Demonstrations of better lighting methods for homes, offices and industrial plants, together with free surveys and reports on improvements possible in existing lighting installations. These and many other features will show the people of Milwaukee the road to more efficient and artistic illuminating methods.

Last, but by no means least in its spectacular attractive appeal to the public, is the "Pageant of Light," a wonderful reconstruction of the progress of lighting fixtures and methods from the flaring torch of the cave-man to the artistic illuminating equipment of today. To all those interested in better lighting the convention week at Milwaukee will be full of instruction, amusement and interest—particularly to electrical men. So make a note in your diary, "Be at Milwaukee Jan. 30 to Feb. 4, 1922."

DISCUSS INTERFERENCE PROBLEMS AT TELEPHONE MEETING.

Classification of Exchanges for Rate Making Purposes Among Subjects Presented at Independent Telephone Association Convention.

Among the principal subjects discussed at the annual convention of the United States Independent Telephone Association held in Chicago this week were the following: "Classification of Exchanges for Rate Making Purposes," by Prof. Charles Allen Wright, department of electrical engineering, Ohio State University, Columbus, O., and William W. Potter, chairman, Michigan Public Utilities Commission, Lansing, Mich.; "Independent Telephony, 1897-1921," by H. D. Critchfield, Chicago, and "Why the Present Hostile Attitude of the Public Towards State Regulation?" by Noah W. Simpson, member of the Missouri Public Service Commission, Jefferson City, Mo.

An important feature of Thursday morning's session was a conference on problems of interference with telephone traffic by electric power lines, in which the telephone company's viewpoint was outlined by S. P. Grace, engineer on foreign wire relations, American Telephone & Telegraph Co., New York City, the power company's viewpoint being discussed by W. J. Canada, engineer, National Electric Light Association, New York City.

Friday morning's session was devoted to a general conference on depreciation, Frank S. Fowler, chief, depreciation section, Interstate Commerce Commission, Washington, D. C., speaking on "The Interstate Commerce Commission's problems in Determining a Depreciation Procedure for Telephone Companies," and C. B. Randall, secretary and general counsel, Tri-State Telephone & Telegraph Co., St. Paul, Minn., and H. L. Harris, vice-president, Kansas City (Mo.) Telephone Co., talking on the subject of "The Depreciation Statement Filed With the Interstate Commerce Commission by the United States Independent Telephone Association."

There were many interesting exhibits of telephone equipment in connection with the convention, among the exhibitors being the following firms: American Electric Co.; Automatic Electric Co.; Bell Lumber Co.; Lynton T. Block & Co.; Bowdle Accounting System; Chance Manufacturing Co.; Cook Electric Co.; Dawson Manufacturing Co.; Electric Storage Battery Co.; Franco Electric Co.; French Battery Co.; Hallett Iron Works; Harrah Manufacturing Co.; Holtzer-Cabot Electric Co.; Kellogg Switchboard & Supply Co.; Leich Electric Co.; Lyon Metallic Manufacturing Co.; McLeod Electric Supply

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Co.; Monarch Telephone Manufacturing Co.; National Carbon Co.; National Pipe & Cable Hanger Co.; Naugle Pole & Tie Co.; Page & Hill; Reliable Electric Co.; John A. Roeblings Sons Co.; Standard Underground Cable Co.; Stewart Bros.; Stromberg-Carlson Telephone Manufacturing Co.; Templeton, Kenly Co. and Thompson-Levering Co.

ELECTRIC CLUB OF CHICAGO NOMINATES OFFICERS.

The Electric Club of Chicago at its Nov. 15 meeting adopted the following constitutional amendments to Article III, sections 2 and 3, of its constitution and by-laws:

"Section 2. The government of the Club shall be intrusted to a board of directors, consisting of the president, first vice-president, second vice-president, the secretary and the treasurer, three trustees, the person who was most recently retired from the office of president, and four additional resident members.

"Section 3. All members of the board of directors shall be elected by the Club, and all of them except the trustees shall hold office for one year. The trustees shall hold office for 3 yrs., one being elected each year."

The regular ticket nominated the following: W. G. Luscombe for president; L. W. Donoho, first vice-president; Paul W. Koch, second vice-president; J. W. Collins, secretary; Otis L. Johnson, treasurer; Wm. A. Jackson, trustee for 3 yrs.; directors, James A. Dawson, J. C. Hale, Thomas A. Brook and Malcolm Carrington. Action on these nominations will be taken Dec. 12.

ACCOUNTING PRACTICE REVIEWED BY COST ASSOCIATION.

Experiences of Actual Operation Reviewed and Discussed—Limitations of Accounting Methods Pointed Out as Well as Advantages.

President H. S. Peck of the Industrial Cost Association gave an address before the opening session of the recent conference of the association at the William Penn hotel in Pittsburgh. He outlined the purposes of the conference and forecasting the future of the association with the co-operation of its members. The formal address of welcome to the association members attending the conference was not given until the afternoon session, when Mayor E. V. Babcock of Pittsburgh extended the freedom of the city. The first paper was presented by S. B. Taylor, general sales manager of the S. K. F. Industries, Inc. He pointed out that the accounting department of an industrial organization can be a real asset in securing business through providing the sales department with fundamental facts which may be compiled in the form of graphic charts, etc., as a guide in establishing sales policies. He emphasized the importance of having these figures compiled in such a way as to pictorially represent facts practically while happening instead of post-mortems.

E. C. Grimley, with a paper telling about the perpetual inventory of the Victor Talking Machine Co., opened up considerable discussion, but the consensus of opinion of the conference was that perpetual inventories are extremely desirable for all stock and stores records, and also for work in process wherever the nature of the business permits of such an arrangement. F. S. Willett, comptroller of the Dodge Manufacturing Co., brought out some valuable information on the responsibility of the comptroller in times of business depression. He supported Mr. Taylor's views on co-operation with the sales department and extended the argument to include the production and executive departments as well. From his angle the comptroller's job was to compile data resulting from business experiences as a guide to business policy. A. W. Wainwright and T. W. Dinlocker of S. K. F. Industries, Inc., read and discussed a paper on "Idleness and Its Relation to Industry, in Retrospect." This was one of the most interesting subjects presented at the conference as practically all the concerns represented had idle plants, departments or machines to be properly taken care of in their accounting methods. The conference finally adopted an expression of opinion that idle facilities should not be included in current costs, but rather should be carried in special accounts or charged to profit and loss.

Better Industrial Conditions Promised for the Near Future.

Addison Boren of Yale & Towne Manufacturing Co., discussed the subject of "Cost Terminology" and outlined plans for making progress with this work. The issuing of what amounts to a cost handbook is another important element of the future work of this association. H. S. Breitenstein's paper on "Budgeting the Plant and Office" was a summary of the methods of the city of Pittsburgh in municipal affairs. His theoretical application to industry in general was not accepted as authoritative by the conference, but his talk was appreciated in that it opened discussion on a subject which although important has received little consideration by industrial officials.

The program of one entire afternoon was devoted to sanitation and safety, with J. B. Ayres of the National Tube Co. giving a general outline of the methods of his company. His remarks were amplified from the angle of cost and profits of this work by William Hogg of the same company. The banquet on Thursday evening was attended by over 150 members and guests, with Mr. Peck acting as toastmaster. Mr. Connolly, commissioner of labor of the state of Pennsylvania, gave an interesting talk on the work of his department and impressions he had gathered as a result of his experiences including work with cabinet members and other influential men of the country. The general tenor of his remarks was that industry had seen its worst and that the unequalled resources of the United States would guarantee a gradual bettering of industrial conditions, contingent upon a better understanding between capital and labor, which is gradually being worked out.

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Sanford Robinson, attorney of New York City, gave a resume on the subject of "Federal Taxation." He went back to the initial federal taxes levied shortly following the Revolution and explained the general nature of the income taxes down to date. He advocated that some distinction should be made between income earned and spent, and income earned and invested—that the latter should really have a preferential rate. J. M. Howell of the General Electric Co., explained how a cost system, although efficient, might demoralize an organization, mainly through over refinement and improper application to problems of a particular industry. It is possible to work up a system that will require more men for its operation than the production department of the organization using the system. In the discussion which followed some instances were cited where such results were obtained, and where the system had to be modified to be more workable, although probably less efficient, theoretically, as a cost system.

TELEPHONE PIONEERS CELEBRATE TENTH ANNIVERSARY.

Demonstration of Amplifier by Col. John J. Carty One of Main Features of Annual Meeting of Organization Held at St. Louis.

The 10th anniversary celebration and annual meeting of the Telephone Pioneers of America held in St. Louis last month was well attended, registration figures showing 631 in attendance, 444 being members of the organization. The newly-elected officers are as follows: President, John J. Carty; senior vice-president, F. A. Stevenson; vice-presidents, B. L. Kilgour, C. H. Rottger and J. J. Robinson; secretary, R. H. Starrett, 195 Broadway, New York City; treasurer, F. A. Buttrick; executive committee, T. P. Sylvan, John H. Passman, Miss Mary T. Reuse, B. A. Kaiser and J. E. Warren.

The Southwestern Bell Telephone Co. gave a demonstration entitled "The Smile Exchange." A "central office" was set up in the meeting room and operators from the Bell company gave a demonstration in connection with furnishing service from one subscriber to another, and also from one central office to another. This was not only interesting, but also educational. There was also a demonstration of the "Loud Speaker" or "Amplifier," in the Municipal Theater at Forest Park, which showed the development and advancement of the science as carried on by Col. John J. Carty and his assistants, Colonel Carty being in charge of the demonstration.

The entertainment features consisted of a Hallowe'en party tendered by the Southwestern Bell Telephone Co., and a sight-seeing trip through St. Louis and its environs, a stop being made at the Riverside Club, on the banks of the Mississippi river, where the Western Electric Co. entertained the party at a luncheon. The annual banquet tendered to the Pioneers and the members of their families by the American Telephone & Telegraph Co. proved a most enjoyable affair, the attendance numbering 628. The party on the "New York Special" was entertained on the "going" trip by the New York Telephone Co. at Niagara Falls, N. Y., and the Indiana Bell Telephone Co. entertained at Indianapolis, Ind. On the return trip the Ohio Bell Telephone Co. entertained at Cleveland.

FALL MEETING OF PUBLIC SERVICE SECTION, N. E. L. A.

The fall meeting of the Public Service Section of the National Electric Light Association was held in Chicago last month. After a few remarks by F. N. Leonard, the retiring chairman, a paper was read describing what transpired between the time a prospective electric customer is approached by the salesman and the receipt of his first bill for service. The process of securing a contract from the customer was described by D. W. Taylor, and the general work of connecting the customer's service to the mains of the company was related by D. A. Pierce. The operation of setting the meters was described by E. J. Larkin and the accounting and billing routine by S. J. Palmer. The joint paper proved to be very interesting to the members of the section, most of whom were present. After the installation of the officers elected for the following year a general discussion with recreative features followed.

ELECTRICAL CREDIT MEN DISCUSS TRANSPORTATION PROBLEMS.

The Electrical Credit Association of the Middle and Southern Atlantic States held its annual meeting Nov. 18 at the Hotel Longacre, Philadelphia. The morning session was occupied by discussions of subjects interesting to the electrical industry. The evening session was featured with addresses by prominent speakers on the following subjects: "Transportation Problems in Their Relation to Revival of Business," "Psycho Analysis and Relativity," and "Observations as Our Boys Came Home From France and Since," this subject relating to the rehabilitation of ex-service men.

URGES BUILDING FUNDS TO MEET BAD TIMES.

If the public utilities could systematically put aside financial reserves in prosperity to be used for construction work and expansion in depression, the recurring periods of business depression might be avoided, or at least greatly decreased, and the consequent unemployment of labor might be much less serious and widespread, according to the statement made recently by Edward Eyre Hunt, secretary of the President's conference on unemployment in his address before the Society of Industrial Engineers.

"The business cycle," he said, "is marked by peak periods of boom between valleys of depression and unemployment. The peak periods of boom are times of speculation, over-expansion, extravagance in living, relaxation in effort, wasteful expenditures in industry and commerce and

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consequent destruction of capital. The valleys are marked by business stagnation, unemployment and suffering. The most hopeful way to check the losses and misery of depression is therefore to check the feverish extremes of 'prosperity.' If our public utilities—electric, gas, street railways and telephones—could put aside surpluses from earnings in times of prosperity for the deliberate purpose of improvement and expansion in times of depressions, we could greatly decrease the depth of depressions. Every encouragement should be given them now to start construction work so as to relieve the situation. It will mean employment to thousands of idle workers if their revenues are sufficient to finance such work as mentioned."

ELECTRIC SURCHARGE RATE CASE IN NEW JERSEY.

In a case before the Board of Public Utility Commissioners of New Jersey, on complaint of the Crucible Steel Co., Harrison, against the surcharge now operative for power service supplied by the Public Service Electric Co., the utility company has submitted figures showing that of 237,682 light and power consumers only 615 have been paying the surcharge of 25%. It is set forth that there are now 229 customers who buy power at wholesale rates as against 235 during 1920. These wholesale users, together with 386 refrigerator rate customers are the only ones subjected to the surcharge. There are 13,320 other power users who are not affected, and to this latter number there is to be added 224,362 lighting consumers. The Crucible Steel Co. and other large power consumers are seeking to have the surcharge abolished and a series of hearings will be held. It is expected that the board will render a decision before the close of the year.

PLANS FOR ELECTRIFICATION OF EASTERN ROADS.

On Nov. 5 Secretary Fall submitted to President Harding, "as a contribution of the Department of the Interior to the common welfare," an analysis made by the Geological Survey of a comprehensive system for generating and distributing electricity to transportation lines and industries in the north Atlantic coast region between Boston and Washington. The survey was authorized by Congress. The engineers who made the survey reported that 970 mi. of 220,000-volt lines and five times that mileage in 110,000-volt lines would be needed.

Electrification of the Boston-Washington area, according to the report, would save 50,000,000 tons of coal annually by 1930, or $190,000,000 in fuel expenditures, while electrification of the railroads would save "11 to 19% on their investment. The question of railroad electrification," it continued, "must be decided according to density of traffic, and so it is that of the 36,000 mi. of main lines, yards and sidings in this superpower zone only about 19,000 mi. could be profitably electrified. This electrification would cost nearly half a billion dollars, but it would save from 11 to 19% on the investment, or an average of 14%. Electrification is the next step in railroad expansion absolutely necessary to increase both the capacity and the efficiency of our transportation system. Incidentally the annual saving of 9,000,000 tons of coal by the railroads would greatly increase the available car supply."

SUSPEND INCREASED RATES ON GAS AND ELECTRICITY.

Permanent suspension of increased gas, electricity, and telephone rates in about 200 cities in Illinois was ordered by the Illinois Commerce Commission Nov. 5, to counteract the effect of a recent court ruling here that applications for higher rates may be temporarily suspended only twice. Companies in Peoria, Beardstown, Sterling, Rock Falls, and Momence have taken advantage of the court order and announced higher rates in violation of the order. The court ruling here was that the law provides for a first suspension of 120 days, when rates are asked, and a resuspension at the end of that time, of six months more.

NEW YORK SECTION, I. E. S., MEETS.

The New York section of the Illuminating Engineering Society held a meeting Thursday evening, Nov. 17, the main feature of which was an address by Dr. W. N. Guthrie, rector of St. Mark's Church (in the Bouwerie), Tenth street and Second avenue, New York City, on the subject of "Color Psychology and Its Application in Church Lighting."

COMING CONVENTIONS.

Electrical Supply Jobbers' Association, Atlantic Division, Cleveland, Nov. 30-Dec. 2. Headquarters, Hotel Cleveland. Secretary, E. Donald Tolles, 52 Broadway, New York City.

American Institute of Chemical Engineers. Fourteenth annual meeting, Baltimore, Dec. 6-9. Secretary, John C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

American Building Exposition, new Cleveland Auditorium, Cleveland, Jan. 4-14. Assistant manager, R. G. Collier, 1305 Schofield building, Cleveland.

Western Association of Electrical Inspectors. Annual convention, Chicago, Jan. 17-19. Headquarters, Hotel Sherman. Secretary, William S. Boyd, 175 West Jackson boulevard, Chicago.

Lighting Fixture Dealers' Society of America. Annual convention, Milwaukee, Jan. 30-Feb. 2. Secretary, J. L. Wolf, Builders' Exchange, Cleveland.

National Council of Lighting Fixture Manufacturers. Annual convention and Lighting Fixture Market, Auditorium, Milwaukee, Jan. 30-Feb. 4. Secretary, Charles H. Hofrichter, 231 Gordon Square building, Cleveland

American Institute of Electrical Engineers. Midwinter convention, Engineering Societies building, New York City, Feb. 15-17. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

National Fire Protection Association. Annual meeting, Atlantic City, N. J., May 9-11. Secretary, Franklin H. Wentworth, 87 Milk street, Boston.

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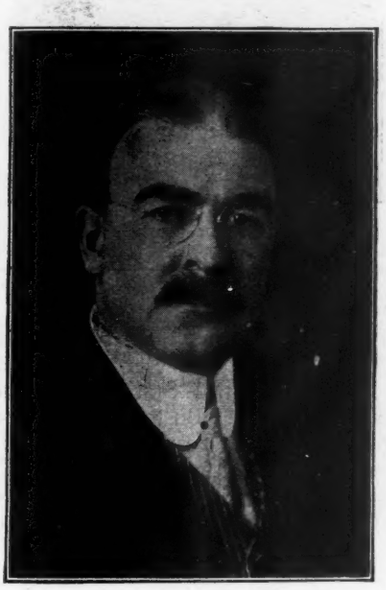
Greater N. E. L. A. Merchandising Sales Bureau

Prominent Manufacturers of Appliances Have Responded to Call of Chairman Greenwood and Will Lend Active Assistance in the More Comprehensive Development of the Electrical Retail Field

C. E. Greenwood, chairman of the Merchandising Sales Bureau of the Commercial Section of the National Electric Light Association, in announcing the activities of the bureau for the coming year in the N. E. L. A. *Bulletin,* includes important subjects in the development of the electrical appliance field, broad in scope and of vital interest. Announcement was made of the complete organization personnel, a feature of which is the "Special Manufacturers' Committee" which will be a part of the Executive Committee of the Bureau.



A. K. Baylor.

Neil C. Hurley.

In seeking to bring about a closer understanding between the manufacturers and merchandising men for the purpose of exchanging viewpoints and discussion of common problems, Chairman Greenwood invited five widely known men in the manufacturing line to serve in the work of the Bureau. These men are announced as leaders in the production of heating devices, washing machines and vacuum cleaners. They are Messrs. A. K. Baylor, General Electric Co.; Neil C. Hurley, president, Hurley Machine Co.; Arthur G. Kimball, president, Landers, Frary & Clark; Robert Kuhn, president, American Electric Heater Co., and Fred Wardell, president, Eureka Vacuum Cleaner Co. The manner in which these men responded to the call for the first meeting is evidence of a keen sense of the present need of the industry, and is indicative of even closer co-operation for the development of the merchandising field.

Important Subdivisions of Work of Merchandising Sales Bureau.

The work of the Bureau is to be divided into five divisions as follows:

Division of Sales Promotion.—To study sales organization and sales methods for the distribution of electrical appliances; to recommend methods for increasing the retail market for various groups of electrical devices in large and small communities, giving attention to the advantages for co-operation between manufacturers, jobbers, central stations and contractor-dealers.

Division of Relation With Manufacturers.—To mark new fields for electrical appliance development; to study the needs of the consumer for various home labor-saving services, and the adequacy of appliances on the market to best meet those needs; to make special notation of maintenance service rendered by the manufacturers; to discuss methods of distribution, advertising, etc.

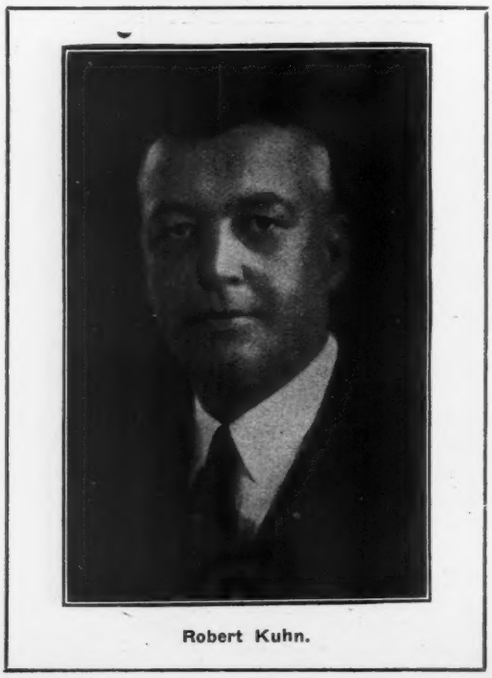
Division of Central Station Merchandising Service.—To make a study of the value of electrical appliances as income producers to the central station and procure data on the subject from different sections of the country; to study the trend of central station merchandising and its importance to the industry, noting increase or de-

crease in appliance selling by the central stations; to discuss the value of the appliance department of a central station and indicate how it can be made a department for service and good-will.

Division of Standardization and Testing.—To encourage and promote the testing of appliances at some central source so that accurate knowledge shall result in standardization and improved quality, combined with lessened cost.

Arthur G. Kimball.

Division of Electric Heating and Cooking.—To make a study of the development of the electric range load and its value to the central station; to recommend methods which will popularize the use of electric cooking and to present plans for the productive selling and promotion of electric ranges; to analyze the market for electric heating devices; to collect data on electric heating and to recommend best methods for selling heating devices.



Robert Kuhn.

It will be noted that the Bureau has recognized the needs of the times in electrical retailing and will govern its effort accordingly.

F. D. Pembleton, of Newark, N. J., has been appointed vice-chairman of the Bureau. C. W. Johnson, Jackson, Mich., heads the Division of Sales Promotion; T. W. Berger, Philadelphia, the Division of Central Station Merchandising Service; R. S. Hale, Boston, the Division of Standardization and Testing; C. O. Dunten, Springfield, Ill., the Division of Electric Cooking and Heating, and F. D. Pembleton, Newark, N. J., the Division of Relations with Manufacturers.

Fred Wardell.

FALL DROUGHT REDUCES ELECTRICAL OUTPUT.

Shortage of rainfall in many sections of the United States during the fall months has reduced the output of electricity from water power to the lowest point in many years, according to the report of the U. S. Geological Survey. The water power output of the United States fell from 1,322,201,000 kw-hrs. in May of this year, to 1,118,407,000 in September. The electrical industry in Oklahoma also suffered because of the drought, the water power production falling from 265,000 kw-hrs. in May, to 203,000 kw-hrs. in September.

The falling off in the amount of coal and natural gas used in the manufacture of electricity produced by fuels continued for the month of September, according to the report. Amount of electricity produced in Oklahoma from natural gas in May required 420,808,000 cu. ft. of gas compared with 325,133,000 cu. ft. in September. The amount of electrical output in Oklahoma from coal in September required was 3345 short tons of coal as against 3968 short tons for May.

COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

FRIENDLY CO-OPERATION REQUIRED TO ASSURE BEST SERVICE.

Relation of Officers and Employes of Utility Companies to Public Explained in Address Before Pennsylvania Electric Association.

By A. W. Thompson,
President, Philadelphia Co., Pittsburgh.

Service to our patrons is, of course, the first thing which comes to our minds. And yet many of the employes and some officers of public utility companies give little thought or attention to this phase of what should be much of their work. In many cases the employe of a public utility feels that he has done his duty when he goes to his office or his work in the morning and leaves in the evening having done what is commonly known as the allotted work for that particular day. Because of this limitation in service there has in the past come about many misunderstandings between the public, public utility officers and their employes, and which has spelled failure for some companies, injured communities which should have been served well, and worked an undue hardship on the employes. It goes without saying that it is much easier to work for a successful company than for one which is a failure.

Part of the daily time of every public utility employe should be given to meeting with people, helping to bring about an understanding and feeling of confidence as well as keeping the public thoroughly informed as to the mutual benefits that can be brought about only through co-operation. In making for such a situation there must be no mystery made in public utility problems. Free and open discussions must be had, coupled with co-operation on the part of all parties.

An ill-tempered laborer attempting to set a pole in defiance of an equally unreasonable person whose property may be near; a right-of-way agent who is arrogant because he knows that the law confers certain rights; a careless meter reader; an inefficient wireman; an independent and impudent clerk at one end of a telephone and a hysterical patron with a complaint at the other, all have their share in keeping the pot of public wrath boiling.

Service to the Investor an Important Duty of Public Utilities.

Friendly public co-operation is one of the most valuable assets that any public utility company can possess; without it the road is rough and sometimes impassable. Toward securing it there must be good company management upon which is impressed a deep sense of duty growing out of responsibility. There must be municipal co-operation, all implying that there must be adequate service requiring reasonable rates, yielding sufficient revenues to enable utilities to render it. to maintain the property in a condition to function, and to yield a fair return to investors whereby more capital when needed can be attracted.

This brings me to the next thought in connection with service, and that is "Service to the Investor." Without credit utility companies cannot attract the necessary capital to furnish the service demanded by the community served. Every community is daily demanding more and better service. Public utility companies cannot cease expanding and making improvements. The population of our country is increasing by leaps and bounds. Difficulties present themselves to every public utility manager, especially in the acquiring of sufficient funds to add to and improve the facilities of his company. It is estimated that in the United States more than a billion dollars annually are required in the electrical industry alone to keep up with the demands for service, and more and better service. Without credit and without a kindly feeling on the part of the public and co-operation of municipal authorities this money cannot be acquired on any reasonable basis of financing, if at all.

We only need to look at some of the public utilities around us, such as the steam railroads and the electric tractions, to note the deplorable conditions existing in those lines today and which are affecting all of us. So that after service to our patrons the next duty is service to our investors in securing for them an adequate and fair return on their investment. There is no way to compel people to invest their funds in public utility securities. It can only be done on a basis of confidence. In this connection some few only seem to realize that the future of a community rests largely upon the service rendered by its public utilities; that is, transportation, both trolley and railroad service; electric light and power; and gas for domestic use.

One of the great services, which is in quite a new direction and which will be steadily developed, is to bring about an elimination of absentee landlordism, that is the greater part of the problem of the moment is not one of things or materials, but of human beings just like you and me.

Now last but not least is that of service to employes—relations between officers and men. How often it occurs that without a proper study of their qualities men are promoted to positions which they cannot successfully fill, only to find after a period that they have been a failure and be pushed back or eliminated from the service of that particular company. This injures them greatly and their families suffer because of having become accustomed to living on the increased compensation which the employe received through promotion. What an appalling situation there is in any family when this happens—and yet how often it seems to take place. Then again, in the hiring of men not sufficient attention seems to be

given to ascertaining whether they are competent for the positions at hand.

Also, junior as well as higher officers of companies do not seem to give the attention to the training of employes in their work and their duty toward their company and the community as they should. So many do not have the incentive because they do not know how to take up their portion of the burden of public and civic work in their communities. With some encouragement along these lines there is no doubt but that many, if not all, employes would be willing to give some part of their time to the work of helping bring about better civic conditions. In doing this they would not only be helping their communities but themselves and, indirectly, their company.

In summing up these three kinds of service: Service to patrons, service to investors and service to employes, what a great responsibility lies upon the shoulders of public utility officers and their companies. These services truly may be condensed into two words—public service.

SEVEN SALIENT POINTS ON PUBLIC UTILITY SITUATION.

Paul P. Haynes, Member of Indiana Public Service Commission, Gives His Views on Present and Future Needs of Public Utilities.

At Indianapolis recently Paul P. Haynes, a member of the Indiana Public Service Commission, which has charge of the regulation of public utilities, was asked to make a public address on the public service situation. His views were desired particularly because he had served on the commission through the war period, when some of the gravest public utility problems in history came before him. Hence, he was invited to handle the situation in any way that he chose.

Mr. Haynes talked over the situation with some of his colleagues on the commission and then went over to the meeting and told the delegates just what public service companies and the public will have to do if the "hired help"—that is the utilities themselves—are to be kept working. It is the high points of this straight-from-the-shoulder talk by a man whose interest is solely the public interest that follow

"*First*—The average increase in utility rates during the past 4 yrs. was substantially less than the average increase in the prices of the necessities of life.

"*Second*—During the past 4 yrs. most utilities have earned less than a fair return upon their invested capital, and equity would seem to require that during the next few years of down-grade prices utility companies should be permitted to recoup reasonable losses suffered in the period of up-grade prices.

"*Third*—Utility rates were not, and are not now, based on the peak of war and post-war operating costs and therefore a considerable reduction in commodity prices can occur before the average of prices generally reaches the point on which utility rates, generally speaking, are now based.

"*Fourth*—There have been millions of dollars of deferred maintenance during the past 4 yrs. which must now be taken care of.

"*Fifth*—One hundred million dollars should be expended for additions and improvements in the next 2 yrs. by the utilities of Indiana in order to give the public services which are vitally necessary to the industrial welfare, health, comfort and convenience of the people generally. Hundreds of millions are needed in other states. The public should know that these vast sums cannot be obtained unless the financial showing of utilities are such as to attract it in a market in which all the world is bidding for money.

"*Sixth*—The credit of utilities has been impaired, and this vast sum of money cannot be raised and the public cannot be served unless the credit of public utility enterprises generally is improved through the medium of adequate revenues.

"*Seventh*—The welfare of the state and the country calls for a broad and sympathetic understanding of these important facts which should be of basic importance in the formation of regulatory policies."

STANDARD'S PROGRESS DESCRIBED IN NEW CIRCULAR.

In connection with the new issue of $3,500,000 secured 7.5% sinking fund gold bonds of the Standard Gas & Electric Co., H. M. Byllesby & Co. has prepared and is distributing a new circular entitled "Foundation Investments," which describes the growth and progress of this utility company. This circular, the front cover of which is reproduced, is in three colors. It contains five graphic charts illustrating the growth of the company's business and a map of the United States with photographic inserts depicting the nature and variety of the business served by the company's subsidiaries.

Foundation Investments

The principles of sound and safe investment are firmly imbedded in well-managed public utility companies.

Public service properties are founded on the daily necessities of the people, and the nature of the services require their continuance as long as people live in cities and towns.

The diversity of the business is limited only by the activities of the people and the natural resources of the territories reached by modern transmission systems.

Light—heat—power—communication—transportation: no civilization can exist without them, efficiently and economically supplied.

Standard Gas & Electric Company

is an investment company owning securities of utility companies which operate in sixteen states in many of the most prosperous and rapidly growing sections of the United States. The properties serve 533 communities, embracing a population of 2,135,000, with electricity or gas, or a combination of utilities.

The strength of Standard Gas & Electric Company lies not in the natural resources or prosperity of any one city or section, but in many.

The company's earnings have grown steadily, as shown by the charts on page 2, throughout its eleven years of existence, including three peace years, three years of European upheaval, two war years and three years of readjustment. Virtually all manufacturing and trading enterprises thrived during the five years of the great war, but these five years were difficult ones for the utilities with explicitly defined rates and increasing costs. Nevertheless they emerged from the conflict stronger than ever before. The period of readjustment through which we are now passing finds the utility companies in a strong position—with constantly growing demands for service and prospects of gradually decreasing operating costs.

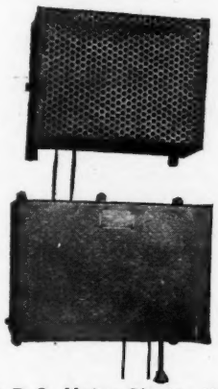
Cover of Circular Concerning Business and Growth of Standard Gas & Electric Co. and Subsidiaries.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Applications of Equipment and Methods in Practice

Automatic D-C. Motor Starter for Small Motors.

A great many installations of automatic starters for d-c. motors of 10-hp. capacity or less are made in relatively remote or inaccessible places where operating conditions are by no means the best. Places where such starters are installed may be damp or subject to



Type SS D-C. Motor Starter With Cover Closed.

fumes which promote corrosion, and through lack of attention it frequently happens that the equipment which the motor drives becomes clogged, jammed or blocked in some manner which will prevent the motor from operating when the automatic starter functions. The result of adverse atmospheric conditions is the deterioration of the equipment, especially of the starting resistance. The result of the load being blocked is the burning of the starting resistance, the motor, or both, and so there has been an extensive demand created for a starter which would withstand these adverse conditions of installation and operation.

To meet this demand the Automatic Reclosing Circuit Breaker Co., Columbus, O., has developed and placed on the market what is designated as the type SS automatic d-c. motor starter. This starter is designed for 250 or 500-volt service in capacities of 3, 5, 7.5 and 10 hp. It is of the counter-e.m.f. type with one step of resistance which is automatically cut out when the motor comes up to speed. This resistance is made of nickel and chromium alley wire—the highest grade material available for withstanding corrosion. It is of such value that it limits the starting current to the full-load current of the motor and is of sufficient capacity to carry this full-load current indefinitely. These elements of design give the type SS starter the special and important characteristics of protecting the motor, should it fail to start its load, against burning out of either motor or starter, and insuring long life under adverse atmospheric conditions.

This starter is applicable in all cases where the starting torque required does not exceed the full-load torque of the motor. In a very large percentage of installations of motors of this capacity it is found that the starting torque required nowhere nearly equals the full-load torque of the motor. Especially is this true of motors, driving pumps, blowers and rotating apparatus not having excessive static or starting friction, or where the load comes on as or after the motor comes up to speed.

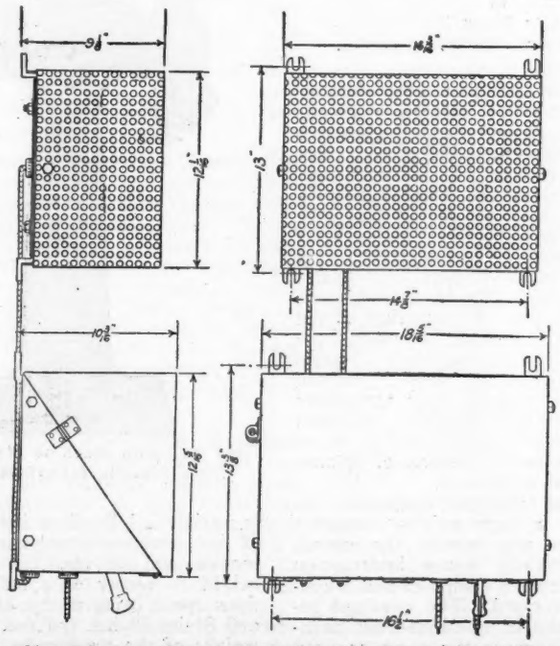
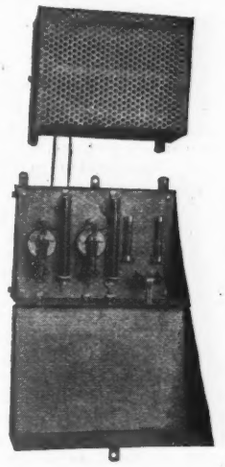


Diagram Showing Overall and Mounting Dimensions of the Type SS D-C. Motor Starter.

As shown in an accompanying illustration the type SS starter consists of two units. One unit comprises the starting resistance mounted and completely housed in a perforated sheetiron box. These boxes are provided with feet



Type SS Starter With Cover Open to Show Mechanism.

for separate mounting on wall, posts, crossarms, or in other convenient place. Connections between the starting panel and resistance are made at the time of installation. The cover and the box housing the panel are provided with lugs for receiving a padlock so that the panel may be secured against exposure of any live parts or molestation by unauthorized persons. The illustrations show the box with the cover closed and with the cover open. The overall and mounting dimensions are shown in a separate diagram. The construction of all details of this starter is rigid and substantial, and all current-carrying parts of ample capacity. The guiding thought has been to produce a reliable and durable starter without sacrifices in either the amount or quality of material or workmanship.

New Limit Switch Assures Safety of Crane Operation.

A new crane safety limit switch known as the type LC, has been put on the market by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This switch is designed to eliminate the undesirable features generally connected with the operation of a crane or hoist installation, when the hoist brake overtravels, resulting in the loss of production and often the injury of workmen due to broken cables, blocks and drums. The normal operating range of the hoist is increased as it permits the handling of a greater amount of material, since there is no necessity of losing time by approaching the limit of travel slowly and cautiously. The safety limit guards the equipment irrespect-

ive of the kind of control or the position of the controller handle or brakes.

Under normal operating conditions of the machine, the limit switch is held in the operating position by the counterweight, which overpowers the torsion operating springs. In case of overtravel, the counterweight is raised by the hoisting hook or other moving part, which permits the strong torsion spring to operate the switch. This disconnects the motor from the line and establishes a closed dynamic breaking circuit through the motor armature, motor series field and resistor, which stops the motor, irrespective of the position or type of the controller or brake. The operation of the switch also releases the series magnetic brake which holds the load until the controller handle is moved to the lowering position. As soon as the hook has been lowered beyond the limit, the switch is again ready to function as before, as it resets itself, automatically. The quick-make and quick-break feature of the switch throws it rapidly from the normal to the braking position when approaching the limit and back to the normal operating position when backing out. It will not remain in a partially open or partially closed position and destroy the contacts or fail to function.

The application for these limits is mainly for controlling the travel of the moving parts of the hoisting machine. However, they may be used on metal mixers, bridges and other applications employing series motors, where it is desired to limit the travel in one direction by applying dynamic braking.

Automatic Starting Switch for Small A-C. Motors.

A compact, light-weight, quick-acting contactor with blowouts and copper-to-copper rolling contacts is the outstanding feature of the new across-the-line type of starting switch just being placed on the market by the Allen-Bradley Co., Milwaukee. This starting switch is for use with small a-c. induction motors that can be connected directly to

Starting Switch With Cover in Place to Protect Mechanism.

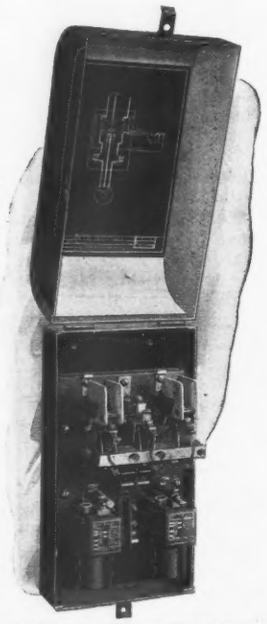
the supply lines. Automatic control of the motor is obtained when the starting switch is used with a push button, pressure gage, float switch, thermostat or any other type of pilot circuit control.

The principle of this switch is not new, as the Allen-Bradley Co. has manufactured across-the-line switches for a number of years, but the design is new and distinctive in the simplicity of the assembly of the switch parts and cabinet. The copper-to-copper rolling con-

Push-Button Station for Allen-Bradley Starting Switch.

tacts, blowouts and the laminated magnetic circuit are of the same design as that used on the larger quick acting magnetic switches, but simplification of the assembly makes this switch available for general use as a safety device with all automatic features where formerly the cost made it prohibitive when compared to manual switches.

Complete overload and low-voltage protection is offered by the starter when



Cover Lifted to Show Mechanism of Allen-Bradley Starting Switch.

used with the standard push button. Failure of the supply voltage or a continuous overload will open the contactor, thus disconnecting the motor. Return of the voltage will not reconnect the motor unless the start button is pressed. Likewise, the motor cannot be started after an overload unless the start button is pressed. When used with float switches or pressure gages, the starters are furnished with hand-reset overload relays to prevent restarting of the motor after an overload has opened the circuit. With these auxiliary controls low-voltage release is offered. Return of voltage to normal after temporary suspension will automatically reconnect the motor and insure continued performance from the pump, compressor or similar connected equipment.

The use of magnetic blowouts, together with a light-weight contactor which makes and breaks the circuit quickly, practically insure interruption of the circuit even under extreme conditions of overload. The overload relays are of the inverse-time-limit dashpot type. They are the same as used for overload protection on all Allen-Bradley starting and current controlling devices, and by other manufacturers as part of their standard starting equipment. The Allen-Bradley relays have a unique double seal of the piston in oil, which insures the full time element, yet there is little motion of the piston until the seal breaks when the piston is released suddenly so that the relay contacts are tripped open quickly and positively. The relays can be set so that a heavy overload will open the switch quickly, but a lighter momentary overload will not trip the switch unless it continues for several minutes. The time taken in pulling the piston out of the oil varies inversely with the amount of current flowing in the current coil. This allows for the momentary overloads that might occur in normal service and yet gives full protection against burnouts. The dash pot is removable and both current and time adjustments can be made quickly and accurately. The settings are visible and predetermined.

Electric Floor Grinder Equipped With Ball Bearings.

The Louisville Electric Manufacturing Co., Louisville, Ky., is marketing a floor grinding machine, which it is stated is of the latest symmetrical design for the prevention of the accumulation of dirt. It is motor ventilated and the air intake is so located that clean air is drawn all the way through it. The machine can be operated continuously without extending the safety temperature limit. For intermittent duty the motor operates satisfactorily with the intake shut off.

The floor grinding machine is equipped with ball bearings and dirt-proof housings; steel safety hoods; side wheels hinged so wheels are easily changed; adjustable tool rests, etc. The motor switch is inclosed in column. The motor is of 2 hp., for either d-c. or 60-cycle a-c. service; no-load speed 1800 r.p.m. The wheels are 12 by 12 by 1

Floor Grinding Machine Made by Louisville Electric Manufacturing Co.

in.; arbor is 1 in. diam. between flanges; 22 ins. between wheel centers for a-c. service and 28 ins. for d-c. service; height to center of spindle is 38 ins., floor space being 28 by 19 ins. for a-c. and 34 by 19 ins. for d-c. service. The weight of the machine is approximately 400 lbs.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Siegel Light Co., Philadelphia, has leased property at 231 Market street for a new local establishment.

Electric Wiring & Insulation Co., New York City, has leased property at 11 West 29th street for local headquarters.

West Philadelphia Electrical Supply Co., Philadelphia, has leased property at 5203 Market street for a new local establishment.

Groton Electrical Devices Co., Groton, N. Y., manufacturer of electrical equipment, has filed notice of change of name to the Airdry Corp.

Blue Bird Corp., Brantford, Ont., Can., is planning the rebuilding of the portion of its plant recently damaged by fire with a loss of about $12,000.

Seville Electric Co., 226 South 52d street, Philadelphia, electrical contractor, has acquired the 2-story building at 282 South 52d street, for a consideration of $35,000, for expansion.

Metropolitan Electrical Supply Co., 41 West 36th street, New York City, recently suffered a fire loss, a portion of its establishment being damaged. An official estimate of the loss has not been made.

Norma Company of America, Long Island City, N. Y., has recently issued a 12-page booklet entitled "Good Fractional Horsepower Motors Made Better," which contains data relative to the use of "Norma" precision ball bearings in fractional horsepower motors.

Alena Steam Products Co., Indianapolis, has purchased a 6-acre tract from the Western Columbia Cabinet Co. preparatory to the erection of a 1-story reinforced concrete and steel shop building. The first unit will cost $40,000. Later wings will be added to this shop as a subassembly and machine shop.

Northern Engineering Works, Detroit, manufacturer of electric traveling cranes, has recently issued condensed general catalog No. 28 on "Northern" cranes for various purposes. While the company specializes on overhead electric traveling cranes and gantries it also makes a line of miscellaneous designs—electric, pneumatic and hand power. In a 4-page folder the company's type E electric cranes in power plants are illustrated and described.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has announced the following changes in its service department: B. B. Burkett has been appointed district service manager in the Seattle office, succeeding N. P. Wilson, who has been transferred to sales service activities on switchboards and similar apparatus in the Seattle territory. The Salt Lake service department has been made a branch of the Denver office, under the direction of A. F. Maccallum, district service manager, Denver. H. R. Davis, formerly district service manager at Salt Lake, will remain at Salt Lake and devote his time to field service work and to securing repair business for both shops.

Atlas Valve Co., manufacturer of regulating devices for every service—Atlas, Standard and Victor—announce that its New York office has been moved to 242 Layfayette st., New York City. E. E. Jones, district manager, is in full charge.

Greenfield Tap & Die Corp., Greenfield, Mass., has issued a new 5 by 7 in. 396-page catalog, No. 46, which covers taps and dies, screw plates, drills and reamers, milling cutters and pipe tools, and contains a large number of useful tables of tapers, wire gage sizes, tap drill sizes, etc.

Freeman-Riff Co., Terre Haute, Ind. has issued Bulletin No. 210, describing the F-R, Type A, portable flight conveyor. The illustrations include line drawings of the conveyor arranged for unloading coal from car to storage shed and mounted on truck for loading coal from shed into wagons.

Metals Coating Co. of America, manufacturer and distributor of the Schoop metal spraying process, by which metallic coating may be sprayed upon any surface, is now in full operation at its new plant, 495-497 North 3d street, Philadelphia, having removed from its former Boston and Woonsocket, R. I. locations.

Yeomans Bros. Co., 1433 Dayton street, Chicago, manufacturer of centrifugal sewage ejectors, Shone pneumatic sewage ejectors and drainage pumps, announces the following representatives: P. E. Fallon, Gazette building, Little Rock, Ark., and Morton McI. Duekart & Co., McComas and Race streets, Baltimore, Md.

Payne Dean Limited, 103 Park Avenue, New York City, manufacturer of the Dean control for electrical operation of water, gas and high-pressure steam valves, has established offices in Pittsburgh and Chicago. C. J. Burrage, late captain in the A. E. F., and formerly of the engineering department of the Cutler-Hammer Manufacturing Co., is in charge of the Pittsburgh office in the Bessemer building. A. H. Kohlbusch, late superintendent of construction for the Public Service Electric Co., has been placed in charge of the Chicago office in the Lumber Exchange building, 11 South La Salle street.

Lewis Electric Co., manufacturer of switches and control equipment, has moved its headquarters from Canton to Minerva, O. J. C. Lewis, president of the company, advises that ground has been broken for the erection of a factory building to facilitate the manufacture of a complete line of electric switches. The first unit of this plant will be of 2-story brick and steel construction, 60 by 160 ft., with two small buildings, one containing a power plant and the other a cleaning and enameling plant. It is stated that the demand for the company's product has been such that the present plant in Canton has been overtaxed and has necessitated the erection of the new plant to enable the company to take care of its rapidly increasing business.

Wellman-Seaver-Morgan Co., Cleveland, has issued bulletin No. 63 bearing the title, "The Wellman Revolving Car Dumper." This car dumper develops and meets the demand for a low-capacity machine, of simple construction, adaptable to plants where the first cost of installation is a governing factor, but where high efficiency, low operating cost and minimum labor are required.

Allis-Chalmers Mfg. Co., Milwaukee, has published an 8-page illustrated bulletin in which direct current motors and generators are described and illustrated. The line described recently was brought out by the company and is designed for belted as well as direct applications. It is said to be particularly suited to the exacting requirements of machine tool service. Among some of the important features as pointed out in the bulletin are: Ratings and speeds corresponding to standard 60-cycle induction motors; a complete line of constant and adjustable speed ratings; cast steel yokes; dust-proof bearings; windings treated to resist oil and moisture; conduit terminal boxes on all motors; improved box type brush holders and interchangeability of parts.

Witherbee Storage Battery Co., 643 West 43d street, New York City, made the following announcement under date of Nov. 9: "Less than a year ago we increased our manufacturing facilities over 100% and we are now compelled to again enlarge in order to satisfactorily take care of demands being made upon us, our business having more than doubled the last 6 mo. Our entire manufacturing operations, carried on at present in our North Bergen, N. J., and New York factories, will be concentrated in the new plant in Belleville (Newark) N. J., prior to the first of the year, and the new factory, which has 30,000 sq. ft. of floor space, will be devoted entirely to the manufacture of Witherbee storage batteries and parts. We have a private siding, thus enabling efficient and economical handling of carload shipments, and our main building, comprising 20,000 sq ft. of manufacturing space, lends itself admirably to large production methods. We will maintain our executive offices in New York and our service department will carry a complete stock supplying our distributors and trade in the Metropolitan district."

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

FRANK E. WATTS gave an interesting address on electrical operations before the members of the Electric Club, Philadelphia, at a noonday luncheon meeting at the Arcadia Club recently.

F. P. TOWNSEND has severed his connection as electrical engineer of the Submarine Boat Corp., and has accepted a position with the Kindred Appliances Co., 39 Cortlandt street, New York City.

HOWELL MACDUFF, son of Thomas Macduff, cashier of the Worcester (Mass.) district of the American Steel & Wire Co., has taken a position on the superintendent's staff at the north works of the company in that city.

BYRON B. EVONS, who was formerly connected with the Pittsburgh Perforating Co., Pittsburgh, has been appointed Pittsburgh district manager of sales for the Milwaukee Electric Crane & Manufacturing Co., Milwaukee, to succeed Charles M. Sullivan.

ALBERT L. SCOTT, vice-president of the engineering firm of Lockwood, Greene & Co., Boston, has been elected a member of the Board of Fellows of Brown University, Providence, R. I. He has been a trustee of the university for some time.

HENRY FLOOD, JR., received his technical education at Cornell University and was for a number of years associated with the electrical industry, beginning with the Newburgh Light,

Henry Flood, Jr.

Heat & Power Co. as assistant to the manager of the electrical department and then as power engineer of the Penn Central Light & Power Co. For the following 7 yrs. he served as chief engineer of the Central Hudson Gas & Electric Co. and later as mechanical engineer for the American Smelting & Refining Co. Mr. Flood has also practiced consulting engineering in New York City and was associated with Dr. John Price Jackson in conducting the power survey for interconnecting the electric utility companies of western Pennsylvania, eastern Ohio and northern West Virginia. His most recent work was acting as engineer-secretary for the Superpower Survey. He at present is in partnership with William S. Murray under the firm name of Murray & Flood, engineers, Grand Central Terminal, New York City.

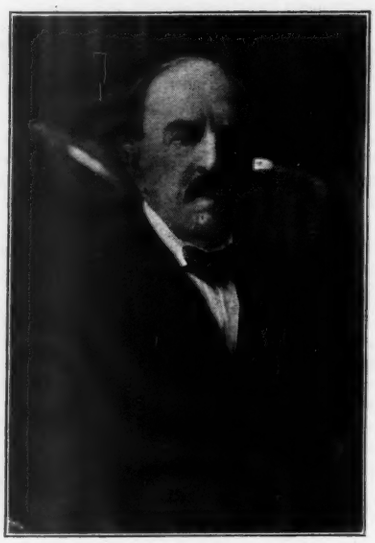
LLOYD P. JOUBERT, formerly draftsman with the Todd Dry Dock & Construction Corp., Tacoma, Wash., is now electrical engineer of the City of Tacoma Lighting Department.

H. L. BURGESS has left the New York office of the American Telephone & Telegraph Co., and is now with the Bell Telephone Co. of Pennsylvania at 1631 Arch street, Philadelphia.

D. M. PETTY, electrical superintendent at the Lehigh plant of the Bethlehem Steel Co., Bethlehem, Pa., will address the Philadelphia section of the Association of Iron and Steel Electrical Engineers Dec. 20 on "Yard Electrification of Industrial Plant Railways."

OBITUARY.

JOHN B. CROUSE, pioneer in the movement to annihilate destructive commercial rivalry in the industrial world by co-operation between business competitors and one of the organizers of the National Electric Lamp Association, died Sunday, Nov. 6, in his 80th year. Mr. Crouse was born at Hartland, Mich., Nov. 29, 1842, and after graduation from high school at Ann Arbor, Mich., he entered the commercial world. Early in the '80s he with H. A. Tremaine established in Cleveland, the Cleveland Carbon Co., which was later merged with the Boulton & Crystal Carbon Co. to form the Standard Carbon Co., with Mr. Crouse as head of the sales department. Later the National Carbon Co. obtained controlling interest in this latter company and the Crouse & Tremaine Carbon Co. subsequently formed in Fostoria, O., by Mr. Crouse. Mr. Crouse while in Fostoria then successively became interested in the Seneca Banking Co., Fostoria Incandescent Lamp Co. and the Fostoria Bulb & Bottle Co. The name of this last company was soon changed to the Fostoria Glass Specialty Co. and the output of the plant was largely used in incandescent lamp production. Later the Fostoria Incandescent Lamp Co., of which Mr. Crouse was president, became a part of the National Lamp Works of General Electric Co. Mr. Crouse was the first and only president of this company. He was one of the pioneers in the incandescent lamp industry, and remained in the business from May, 1898, until Jan. 1, 1916. At that time he was chairman of the advisory board of the company. At the time of his death Mr. Crouse was president of the Crouse-Tremaine-Kulas Co., of Cleveland, and the Arctic Ice Cream Co., of Detroit. He is survived by one son, J. Robert Crouse, by his widow, Mrs. Edith May Avery-Crouse, and by two stepdaughters, Mrs.



J. B. Crouse.

C. C. Gale and Miss Grace Avery, all of Cleveland. Mr. Crouse was a thirty-second degree Mason and was a member of Al Koran Temple of the Mystic Shrine. The bitter warfare between lamp manufacturers which had been waging for several years, reached its climax some 15 yrs. ago and quality was being sacrificed to make sales, so Mr. Crouse and his associates, H. A. Tremaine, J. R. Crouse, F. S. Terry and B. G. Tremaine conceived the idea of concentrating the lamp business of the country and formed the National Electric Lamp Association with the members united on a standard of quality. A mutual engineering department and laboratories were immediately established and soon the scope of the co-operative effort was widened to embrace sections in chemical and physical research, testing, factory inspection and organization, illuminating engineering, technical publicity, business development and managerial and sales conferences with the result that the industry today is on a sound and thriving basis. At one time Mr. Crouse was vice-president of the Cleveland Gas & Electric Fixture Co., but of recent years had not been active in business. J. B. Crouse was really the father of the idea of co-operation in the electrical industry. He believed that intelligent co-operation makes possible service and progress. And he lived to see his faith justified. In his death a half dozen companies lost a business friend whose advice and counsel had been heeded for more than a score of years. And legion friends lost a friendship they had learned to cherish.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES

Deer Isle, Me.—Deer Isle Electric Light & Power Co. has been organized to operate an electric light and power system in this section. F. M. Haskell is president, and Harris W. Haskell treasurer.

Everett, Mass.—Malden Electric Co., 129 Pleasant street, Malden, Mass., will soon take bids for erection of a power plant, at Everett, to cost about $65,000. Charles H. Tenney Co., 201 Devonshire street, Boston, is engineer.

Fall River, Mass.—The Board of Directors, Fall River Hospital, has completed plans for the erection of a power house at the institution.

Haverhill, Mass.—Haverhill Gas Light Co. has made application to the State Department of Public Utilities for permission to issue capital stock to an amount of $146,250, the proceeds to be used for extensions, improvements, etc.

North Truro, Mass.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., will make extensions and improvements in its radio station at North Truro.

Waterbury, Conn.—Electric motors and other industrial electrical equipment will be installed in the 3-story plant addition to be erected by the Henry Weyand Co., 16 Jefferson street, manufacturer of metal products.

Waterbury, Conn.—Connecticut Light & Power Co. has arranged for a preferred stock issue of $4,000,000, the proceeds to be used for plant extensions and improvements. A hydroelectric power plant at Stevenson, on the Housatonic river, rated at 25,000 hp. capacity is now being operated, as well as a leased steam-electric generating station of 33,000 hp. at Waterbury. The transmission system totals 86 mi. Irvin W. Day is vice-president.

Saylesville, R. I.—Sayles Finishing Plants, Inc., is planning the rebuilding of the power house at its textile mills, recently destroyed by fire.

Brooklyn, N. Y.—Brooklyn Edison Co., 360 Pearl street, plans erection of a power plant on 66th street at a cost of $120,000. Address G. L. Knight, engineer.

Brooklyn, N. Y.—Kings County Lighting Co., 4802 New Utrecht avenue, has filed plans for construction of a 1-story building at First avenue and 55th street, to be used for general operating services.

Brooklyn, N. Y.—It is reported that merger plans are under way for a consolidation of all lighting utility companies operating in this city. The combine will include the Brooklyn Edison Co., Brooklyn Union Gas Co., Kings County Lighting Co. and the Brooklyn Borough Gas Co. The aggregate capitalization of the companies involved in the projected merger is $55,000,000.

Buffalo, N. Y.—The city council is considering an ordinance covering the electrification of all steam railroad lines entering the city to be completed by Feb. 1, 1923.

Buffalo, N. Y.—T. Kennard Thomson and Peter A. Porter, Marine Bank building, are planning the construction and operation of a hydroelectric generating plant on the Niagara river, below Niagara Falls. Application for permission for the project has been made to the State Water Power Commission.

Buffalo, N. Y.—Considerable electrical equipment, power apparatus, etc., will be installed in the 5-story baking plant to be erected by the National Biscuit Co. at Fougeron street and the Belt Line Railway, to be 200x360 ft., and estimated to cost $1,000,000. Local headquarters of the company are at 217 Ellicott street, and New York headquarters are at 10th avenue and 15th street.

Gilbertsville, N. Y.—The common council has received permission from the Public Service Commission to construct and operate a municipal-electric light and power plant for local and neighboring commercial service. Work will be inauguarted at once.

Ithaca, N. Y.—New York State Gas & Electric Corp., 123 South Cuyhoga street, will make extensions to cost $25,000.

New York, N. Y.—Electric Bond & Share Co., 71 Broadway, is arranging for an increase in capital from $20,000,000 to $25,000,000, the proceeds to be used for the operation of its various utility properties, extensions, improvements, etc.

New York, N. Y.—Considerable electrical and mechanical equipment will be installed in the proposed municipal recreation pier and convention hall now being projected by the city, to be located on the Coney Island waterfront. The structure will be of reinforced concrete, and is estimated to cost $1,000,000. Murray Hulburt, dock commissioner, Municipal building, is in charge.

Niagara Falls, N. Y.—Niagara Falls Power Co. has acquired a tract of about 40 acres of land in the northern section of the city to be used for general operating service.

Utica, N. Y.—Considerable electrical equipment and refrigerating apparatus will be installed in the local cold storage plant to be constructed by the State Hospital Commission, Albany, N. Y., at the Utica State Hospital. It will be 2-story, and is estimated to cost about $135,000.

Alloway, N. J.—Plans are being arranged for installation of an electric light and power system in the borough. A transmission line for service will be constructed from Quinton, N. J.

Lake Hopatcong, N. J.—Brady Brothers, operating a local ice plant are planning the rebuilding of the power house at their works, recently destroyed by fire, with loss, including other plant buildings, estimated at $150,000.

Montclair, N. J.—The board of city commissioners is considering an ordinance covering an appropriation of $45,000 for the installation of new street lamps on Bloomfield avenue and other prominent thoroughfares.

Newark, N. J.—General Leather Co., Frelinghuysen avenue, has filed plans for the construction of a powerhouse at its plant.

Newark, N. J.—Igoe Brothers have filed plans for the erection of a 1-story power house at their wire-making plant on Poinier street.

Newark, N. J.—Public Service Corp. Public Service Terminal building, has arranged for a new stock issue to total $2,000,000, the proceeds to be used for general operations, plant extensions, improvements, etc.

Newark, N. J.—The local federation of improvement associations has appointed a committee of six to confer with the municipal officials relative to the construction and operation of the proposed municipal power plant in the city, recently voted upon favorably by citizens.

Scotch Plains, N. J.—The board of freeholders, Court House, Elizabeth, N. J., has awarded a contract to E. G. Woolfolk & Co., 15 West 38th street, New York, for extensions and improvements in the county power plant at Scotch Plains, to cost about $25,000.

Trenton, N. J.—Acme Sanitary Pottery Co., May street, plans to install machinery and electrical equipment in the 1 and 2-story addition to be erected at a cost of $80,000.

Millsboro, Del.—The common council is arranging for the immediate installation of an electric lighting system. It is proposed to have the lines ready for service by the close of the year.

Allentown, Pa.—The city council is placing different sections of its new street lighting system in service, and proposes to have all thoroughfares now arranged for in operation before the close of the month. It is said that the system will be extended to other streets.

Allentown, Pa.—Pennsylvania Power & Light Co., is arranging for an extension in its lines in the vicinity of Topton. The Topton Electric Power Co., has filed a protest with the Public Service Commission against

the entering of such territory by the Pennsylvania company.

Braddock, Pa.—Considerable electrical equipment, including motors, etc., will be installed in the addition to be constructed to the plant of the Diamond Ice Co., 48 Sixth street. Work will be placed under way at once.

Carlisle, Pa.—The Lighting Committee recently appointed by the Chamber of Commerce is developing plans for the installation of an improved street-lighting system in the business district. O. H. Starner is head.

Chambersburg, Pa.—The Greene Township Electric Co. has been organized with a nominal capital of $5000, to operate a local light and power system. J. G. Schaff, is treasurer.

Erie, Pa.—Considerable electrical equipment will be installed in the group of county buildings to be erected by the Department of the Poor, 730 State street, at Dobler Farms, estimated to cost about $350,000. M. L. Davis is secretary.

Fayetteville, Pa.—Fayetteville Electric Light & Power Co. has been organized under state laws to operate a local light and power system. H. G. Sollenberger is treasurer.

Harrisburg, Pa.—The Public Service Commission has ordered a hearing in a complaint brought by the McClintic-Marshall Co., Pittsburgh, building contractor, against the Philadelphia Suburban & Electric Co., asking $6200 damages, because of the discontinuance of electric service which compelled a suspension of operations at the company's iron and steel plant.

Hegins, Pa.—Hegins Light & Power Co. has been organized under state laws to install and operate a local light and power system.

Highspire, Pa.—The common council has entered into a contract with the Harrisburg (Pa.) Light & Power Co., for electric power for street-lighting service.

Lancaster, Pa. — Lancaster Milk Products Co. will build a powerhouse at its local plant at 623 32d street.

Millerton, Pa.—Millerton Electric Light & Power Co. has filed notice of increase in its capital stock from $7500 to $14,500, for proposed expansion.

Pequea, Pa.—Pequea Electric Co. has been chartered under state laws with a capital of $10,000, to operate an electric light and power system in Martic township. The company is headed by John H. and Elain H. Meyers, and H. M. Stauffer.

Philadelphia, Pa.—Bids are being received by the city on several substations. Address Electricity Commission.

Philadelphia, Pa.—The Water Bureau has awarded a contract to the General Electric Co. for transmission cables for use at the Belmont and Shawmont municipal pumping plants. New pumping machinery will be installed, with motors and other electrical equipment.

Philadelphia, Pa.—Electrical equipment, including motors, etc., will be installed in the new plant to be erected by the American Ice Co., Sixth and Arch streets, at Belmont and Girard avenues. Plans are nearing completion.

Philadelphia, Pa.—The Transit Department, City Hall, will soon commence the installation of an electrical conduit system for the Frankford elevated railroad lines. Bids have been taken for the construction of a series of electric substations for the railway.

Philadelphia, Pa.—Department of city transit, City Hall, will take new bids for a power house at Cumberland and Kensington streets.

Philadelphia, Pa.—The Department of Public Works, Bureau of City Property, City Hall, has plans nearing completion for the construction of a central power house for the Independence Hall group of buildings.

Pittsburgh, Pa.—Duquesne Light Co. plans a 1-story power house.

Pittsburgh, Pa.—West Penn Power Co. has made application to the Public Service Commission for permission to extend its system in Jefferson, Clarion, Venango, Elk and Lawrence Counties, covering certain townships now adjacent to present operations. The application has been opposed by the Rockland Water Power Co. and the Clarion River Power Co. The latter company has surveys under way for the construction of a new hydroelectric generating plant on the Clarion river, vicinity of Foxburg.

Scranton, Pa.—Scranton Electric Co. has arranged an extension and improvement program in plans and system to cost about $1,000,000. A new 20,000 kw. turbogenerator will be installed at the company's plant.

Towanda, Pa.—Towanda Electric Illuminating Co. has commenced the construction of a power house.

Baltimore, Md.—Consolidated Gas, Electric Light & Power Co., Lexington building, will defray an amount of $1,017,509 for city and state taxes for the year 1921.

Baltimore, Md.—The fire department is completing plans and will call for bids at an early date for the erection of a building for central fire alarm service, electrically operated, to be located on Lexington street, and estimated to cost about $75,000.

Bettertown, Md. — Colonial Hotel Co. has plans under way for the construction of an electric light and power plant for local service. Clarke & Dudnick are architects.

Cumberland, Md. — Monongahela Power & Railway Co. is completing the construction of a transmission line to the properties of the Jamison Coal & Coke Co. The mines will be equipped for electric operation in all departments. The Monongahela company is also building a transmission line from Flemington to the Bear Valley district, where service will be furnished to the Cambria Coal Co. This latter organization will equip its mines for electric operation to develop a capacity of about 5000 tons per day.

Norfolk, Va.—Electric hoisting and conveying machinery, and other electrically operated freight-handling equipment, will be installed at the proposed new municipal piers and grain elevator, to be constructed by the city council. A bond issue of $5,000,000 will be provided for the project. Preliminary plans are under way.

Clarksburg, W. Va. — Clarksburg Gas & Electric Co. has entered into an agreement with the Monongahela Power & Railway Co. for a supply of electric energy at high tension, to be reduced to commercial voltage by the Clarksburg Co. for local distribution.

Kearneysville, W. Va.—Northern Virginia Power Co, Winchester, Va., is planning an extension in its power lines to Middleway, near Kearneysville.

Wheeling, W. Va. — Davis-Carle Co. has been organized to operate an electric light and power system in this section. The company is headed by Ray L. Davis and J. H. Carle, both of Wheeling; and J. E. Rehm, Brookside, O.

Pilot Mountain, N. C.—The city plans to install an electric lighting system. Address the mayor.

Pittsboro, N.C.—The common council has awarded a contract to the Moncure Mfg. Co., Moncure, N. C., for installation of an electric substation for municipal lighting service.

Jacksonville, Fla.—A lighting system may be installed in Hemming Park. Address the mayor.

Lake Worth, Fla.—The common council has preliminary plans under way for extensions and improvements in the municipal electric plant. New equipment will be installed. Ward Randolph is city engineer in charge.

San Antonio, Fla.—The common council is planning the construction of a municipal electric lighting plant. It is proposed to build a power line from the present plant at Dade City, Fla., for the local service.

NORTH CENTRAL STATES.

Marietta, O.—An ordinance has been passed by the council providing for an issue of $5000 worth of electric light improvement bonds. Address William N. Sprague, mayor.

Norwalk, O.—Bonds in the amount of $30,000 have been sold for improving the electric light plant. Address the mayor.

Detroit, Mich.—Detroit Edison Co. has acquired the light and power plants now furnishing service at Williamston and Webberville, Mich., and in the future will operate in this district. Plans are under way for the construction of a new power station at Webberville, with extensions and improvements.

Marlette, Mich.—Plans are being completed for a power plant. R. L. Blackman is the designer.

Plainwell, Mich.—Plans are under way for the construction of a boulevard lighting system. Address the mayor.

Tecumseh, Mich.—Pliny Gratz and R. J. McCoy have purchased the plant of Dundee Electric Co. and are planning to extend lines to Tecumseh for both light and power. A water wheel and other machinery will also be installed for the production of electric current at the Quaker mill.

Bloomington, Ind.—The city plans installation of a new ornamental system of street lighting. Address the mayor.

Huntington, Ind.—Bippus Utilities Co. has been incorporated with a capital of $100,000, of which amount $50,000 will be preferred and $50,000 common stock. The company will operate a light, heat and power plant. J. F. Bippus, Frank Martin, Harry Helm, and J. A. Browne are the incorporators.

Indianapolis, Ind.—The power plant of the Interstate Public Service Co. was recently damaged by fire.

Mitchell, Ind.—E. E. Dan Co. is negotiating for the purchase of the electric light plant for approximately $45,000.

Arenzville, Ill.—Arenzville Light & Power Co. has increased its capital stock from $25,000 to $50,000. Address Herman H. Wessler, president.

Barrington, Ill.—Petitions are being prepared for the proposed ornamental street lighting and for lamps from the Union station to the new subway beneath the Illinois Central tracks at Washington street and from the subway to Mercer avenue. Address the city engineer, Lancaster.

Bloomington, Ill.—The city plans to install an elaborate lighting system in residential areas. Address the mayor.

Champaign, Ill.—The city plans installation of a University District lighting system, to cost $82,000. A total of 540 lamps will be placed. Address the mayor.

DeKalb, Ill.—A petition has been presented by the property owners on North Third street for ornamental lights as on Lincoln Highway. The matter will be taken up by the street and alley department.

Mt. Carmel, Ill.—The city council has a new lighting franchise under consideration. This ordinance, after it is adopted, will be submitted to the voters at a special election. Address the city clerk.

Mt. Vernon, Ill.—Southern Illinois Light & Power Co. of Hillsboro will extend light lines, gas and water mains into Mt. Vernon.

Peoria, Ill.—Central Illinois Light Co plans extensions and improvements to its plant.

Eagle River, Wis.—An election will be held to vote on the question of issuing bonds for installation of a generator in the power plant at Otter Rapids and for laying 2600 ft. of water mains. Address the mayor.

Menominee, Wis.—The property owners of Edgewood Beach, north of Menominee, have consulted with the M. & M. Light & Traction Co. and preparations are being made for the installation of an electric light line along the bay shore road, north of Turtle Creek. Address the manager of traction company.

Two Rivers, Wis.—Bids were received Nov. 10 for the erection of an addition to the power house, to be used for an office, in accordance with the plans prepared. Address Jos. Doleysh, secretary.

Duluth, Minn.—Subscriptions to the amount of $2300 will be required for the West Duluth "white way." Address Commissioner Phillips.

Crane, Mo.—J. P. Cantrell Oil Co. is planning the construction of an electric light and power house.

Independence, Mo.—The common council is arranging a bond issue of $35,000, the proceeds to be used for extensions in the electric-lighting system.

Joplin, Mo.—The chamber of commerce recommends the establishment of a fire alarm system. Address the mayor.

Kansas City, Mo.—The Kansas City Power & Light Co. has been granted permission by the Public Service Commission to issue bonds for $2,000,000, the proceeds to be used for general operations, extensions, improvements, etc. The company has preliminary plans under way for the construction of a new transmission line from Parkville to Farrell View, Mo.

Mexico, Mo.—The city is planning a material improvement in the lighting system. Address the mayor.

Montgomery City, Mo.—E. H. Algermissen is planning the rebuilding of his electric light and power plant, used for local commercial service, recently destroyed by fire.

Osceola, Mo.—H. O. Smith, Springfield, Mo., is planning the erection of a power plant, estimated to cost $150,000.

St. Louis, Mo.—St. Louis Lead & Oil Works, International Life building, has broken ground for the construction of a 1-story power house at its local plant.

Endicott, Nebr.—A special election will be held to vote bonds amounting to $4000 to supply the town with electric lights. The proposed plan is to build a transmission line from the Fairchild brick and tile plant to use the surplus supply of electricity that the firm is under contract to use from the Fairbury plant.

Randolph, Neb.—The common council is planning the construction of an addition to the municipal electric power plant to cost $65,000. Bonds have been provided.

SOUTH CENTRAL STATES.

Carrollton, Ky.—The board of city trustees has plans under way for the installation of a municipal lighting plant, estimated to cost $20,000. Bonds will be voted.

Falmouth, Ky.—The city plans improvements in its electric light and water plants. The mayor is in charge of the projects.

Duncan, Okla.—The common council will soon commence proposed additions to the municipal electric power and water plants, estimated to cost $300,000. J. F. Elwell, city manager, is in charge.

Hugo, Okla.—Jacobson Engineering Co., 533 Metropolitan Bank building, Minneapolis, Minn., has prepared plans for a hydroelectric power plant to be erected near Hugo by the Hugo Power Co. Address W. T. Larimore, secretary.

Manchester, Okla.—The common council has authorized W. B. Rollins & Co., engineers, 209 Railway Exchange building, Kansas City, Mo., to prepare plans and specifications for the construction of a transmission line to Anthony, Kan., for power supply at Manchester. Bonds have been voted for the improvement.

Purcell, Okla.—The common council is perfecting plans for extensions and improvements in the municipal electric lighting system.

Houston, Tex.—Houston Light & Power Co. has arranged an appropriation of $700,000 to carry out improvement work now under way in plans and system, and for proposed additional expansion. New generating equipment will be installed in the local power plant to increase the capacity about 50% and a new high-tension switching department will be provided. S. R. Bertron, Jr., is manager.

WESTERN STATES.

Kemmerer, Wyo.—Charles Budd is promoting the construction of an electric railway in Green River valley, to be a co-operative enterprise, built and operated by ranchers and property owners.

Seattle, Wash.—Puget Sound Power & Light Co. is planning plant improvements.

Klamath Falls, Ore.—Fort Klamath Meadows Co. has applied to the Federal Power Commission for a preliminary permit to install pipe-line, flume and ditch to generating plant for light and power purposes.

PROPOSALS.

Fort Smith, Ark.—Bids are being received for the furnishing of new machinery to be installed in the power house of the Fort Smith Light & Power Co. A 7000-hp. addition will be made to the plant. Address D. C. Green, manager.

Soldiers Grove, Wis.—E. E. Dillon, consulting engineer, Washington building, Madison, Wis., is taking bids in behalf of the Atley Peterson estate, for a water wheel, generator, switchboard, etc., for a new hydroelectric power plant and dam to be constructed at a cost of $50,000. Address Clarence C. Peterson, general manager.

INCORPORATIONS.

Boston, Mass.—A. P. Merchant Co. Capital, $100,000. To manufacture electrical appliances. Incorporators: Alfred P. Merchant, Gloucester, Mass.; Frank W. Johnson, Milton, Mass.; and P. L. Troy.

Newark, N. J.—National Light & Electric Co. Capital, $100,000. To manufacture electric lights, etc. Incorporators: George Ollendorf, Albert R. Hammerslag and Harry Hirsch. The company is represented by Harry A. Friedman, 9 Clinton street.

London, Ont. — Taylor - Campbell Electric Co., Ltd. Capital, $250,000. To manufacture and deal in electrical machinery, equipment, dynamos, lighting plants, etc. Incorporators: John M. Marshall, Earl L. Campbell, Albert T. Taylor and others.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Offering of Connecticut Light & Power Co. Preferred Stock.

Stone & Webster, Inc., and Estabrook & Co., of New York City, are offering an issue of $4,000,000 Connecticut Light & Power Co. cumulative 8% preferred stock at a price of 98 and accrued interest, yielding over 8.16%. The Connecticut Light & Power Co. supplies electric light and power to a population of about 300,000 in an important industrial section of Connecticut, including the cities of Waterbury and New Britain and the Naugatuck valley district.

Gold Bonds of Utah Power & Light Co. Offered to Public.

The Utah Power & Light Co. has sold $2,000,000 first lien and general mortgage 6% gold bonds to the Harris Trust & Savings Bank of Chicago. The bonds are due Feb. 1, 1944, and are being offered at 94 and interest, yielding 6.5%.

Southern California Edison Co.

Month of September:	1921.	1920.
Gross earnings	$1,604,682.32	$1,544,388.56
Expenses and taxes	618,745.08	648,646.72
Net earnings	985,937.24	895,741.84
Fixed charges	331,164.95	280,493.12
Balance	654,772.29	615,248.72
12 mo. ending Sept. 30, 1921:		
Gross earnings	16,332,108.41	13,398,883.62
Expenses and taxes	6,723,684.74	5,895,936.06
Net earnings	9,608,423.67	7,502,947.56
Fixed charges	3,591,532.40	3,110,876.99
Balance	6,016,891.27	4,392,070.57

Cities Service Co. Operations for August.

August earnings of the Cities Service Co. showed material improvement over those for the preceding month, there having been a gain of $32,369 in gross, of $10,561 in net after interest charges, and of $9449 in amount available for reserves, common stock and surplus. Gross earnings of the company for August were $731,041, with a balance of $474,653 after providing for all expenses, taxes and interest. For the 12 mo. ending Aug. 31, 1921, gross earnings were $17,219,881 and the balance after expenses, taxes and interest was $14,530,698. After setting aside the amount required for dividends on the preferred stock, there was a balance for the 12 mo. for reserves, common stock and surplus of $9,703,904, equivalent to $21.74 a share on the average amount of common stock outstanding for the 12 mo. Total surplus and reserves of the company Sept. 10, 1921, were $51,131,011.

The public utility situation throughout the country is showing steady improvement, reports from all sections indicating a material increase in net earnings of utility properties as a whole compared with 1920. Almost since the first of the year, net earnings of the utility properties of the Cities Service Co. as a whole have been showing gratifying and steady improvement, and early in the year it was predicted that 1921 would be the best year in the history of these properties from the viewpoint of net earnings. Actual earnings of these properties for the first 8 mo. of 1921 make it practically certain that this prediction will be borne out by the full 12 mos.' results. Satisfactory rate adjustments have been made at many properties, economies in operation have continued to be effected and the relation between companies and the communities served improved.

The improvement in the net earnings of these properties has been made under depressed business conditions, with industrial loads of electric light and power companies largely reduced and with street railway and gas earnings not what they would have been under normal conditions. Indications based on reports for substantially all properties now point to increased demand for industrial power load, together with improvement in earnings of the street railway and gas departments. While there were no important changes in rate schedules of the properties in August, work has been progressing quite satisfactory on further projected adjustments.

With the granting of the franchise of the Community Traction Co. in Toledo, and the segregation of the electric light and power and gas departments from the street railways, the name of the Toledo Railways & Light Co. is now being changed to the Toledo Edison Co., and permanent financing of the Toledo Edison Co. has been effected whereby the company will be placed in a most satisfactory position as regards working capital and means for financing its future requirements. In connection with the retirement of various issues of bonds and the funding of floating indebtedness, the Toledo Edison Co. has sold $13,500,000 principal amount of first mortgage 20-yr. gold bonds to Harris, Forbes & Co. and the National City Co. of New York, and $2,500,000 prior preferred stock to the National City Co. of New York and the Union Trust Co. of Cleveland.

Western Union Telegraph Co.

The earnings report of the Western Union Telegraph Co. for the 9 mo. ended Sept. 30, 1920 and 1921 (month of September, 1921, estimated) is as follows:

	1921.	1920.
Gross revenues, including dividends and interest	$78,925,600.00	$91,544.687.00
Maintenance: Repairs and reserved for depreciation	13,677,100.00	12,671,277.00
Other operating expenses, including rent of leased lines and taxes	57,910,130.00	67,329,523.00
Total expenses	71,587,230.00	80,000,800.00
Balance	7,338,370.00	11,543,887.00

Binghamton Light, Heat & Power Co.

Earnings Statement.

	August, 1921.	August, 1920.
Operating revenue	$73,060.25	$64,796.47
Operating expenses, maintenance, depreciation and taxes	55,491.49	54,786.10
Operating income	17,568.76	10,010.37

Statement of balance of net income for the 12 mo. ended Aug. 31, 1921 and 1920:

	1921.	1920.
Operating revenue	$ 875,834.74	$ 637,956.98
Operating expenses and taxes	463,813.32	397,809.69
Maintenance and depreciation	158,991.19	81,201.14
Total operating expenses, maintenance, depreciation and taxes	622,804.51	479,010.83
Operating income	253,030.23	158,946.15
Other income	8,922.72	5,020.34
Total income	261,952.95	163,966.49
Deductions from income.		
Interest on funded debt	92,525.00	79,718.31
Other deductions from income	34,745.14	23,265.11
Total deductions from income	127,270.14	102,983.42
Net income	134,682.81	60,983.07

Dividends.

	Term.	Rate.	Payable.
Conn. Pr., pfd.	Q.	$1.50	Dec. 1
Consolidated Gas	Q.	$1.75	Dec. 15
Elec. Invest. Corp.	Q.	1.5%	Nov. 22
New Hampshire & Mass. El.	Ini.	$1.25	Nov. 15
Phila. El., com.	Q.	1.75%	Dec. 15
Phila. El., pfd.	Q.	2%	Dec. 15
Rochester G. & El., 5% pfd.	Q.	1.25%	Dec. 1
San Joaquin L. & P., prior pfd.	Q.	$1.75	Dec. 15
San Joaquin L. & P., pfd.	Q.	$1.50	Dec. 15
Tampa Electric	Q.	$2.50	Nov. 15
J. G. White Eng., pfd.	Q.	$1.75	Dec. 1

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Nov. 7.	Bid Nov. 15.
Adirondack Electric Power of Glenns Falls, common	6	12	12
Adirondack Electric Power of Glenns Falls, preferred	6	81	82
American Gas & Electric of New York, common	..	115	115
American Gas & Electric of New York, preferred	6	41	41
American Light & Traction of New York, common	..	93	95
American Light & Traction of New York, preferred	6	79	79
American Power & Light of New York, common	4	67	73
American Power & Light of New York, preferred	6	72	6
American Public Utilities of Grand Rapids, common	..	7	6
American Public Utilities of Grand Rapids, preferred	..	15	16
American Telephone & Telegraph of New York	9	109½	111
American Water Works & Elec. of New York, common	..	6	6
American Water Works & Elec. of New York, particip	7	15½	16
American Water Works & Elec. of New York, 1st preferred	..	60	60
Appalachian Power, common	..	5	5
Appalachian Power, preferred	7	51	51
Cities Service of New York, common	+extra	201	219
Cities Service of New York, preferred	6	56½	60
Commonwealth Edison of Chicago	8	111	110½
Comm. Power, Railway & Light of Jackson, common	..	8	9
Comm. Power, Railway & Light of Jackson, preferred	6	26	25
Federal Light & Traction of New York, common	..	8	8
Federal Light & Traction of New York, preferred	..	60	60
Northern States Power of Chicago, common	..	53½	60
Northern States Power of Chicago, preferred	ex.div.7	80	80
Pacific Gas & Electric of San Francisco, common	..	..	62
Public Service of Northern Illinois, Chicago, common	7	81	81
Public Service of Northern Illinois, Chicago, preferred	6	82	81
Standard Gas & Electric of Chicago, common	..	8	9
Standard Gas & Electric of Chicago, preferred	8	34	35
Tennessee Railway, Light & Power of Chattanooga, common	..	1	1
Tennessee Railway, Light & Power of Chattanooga, preferred	6	5	5
Western Power of San Francisco, common	..	30	29
Western Union Telegraph of New York	..	84	88
Industrial—			
General Electric of Schenectady	8	133	133
Westinghouse Electric & Mfg. of Pittsburgh, common	7	46	46½